UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RESULTS OF CORE DRILLING IN 1978 FOR OIL SHALE IN THE EOCENE GREEN RIVER FORMATION, PICEANCE CREEK AREA OF WESTERN COLORADO

By

M. C. Smith and R. B. O'Sullivan

Open-File Report 82-476

1982

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INTRODUCTION

In 1978, the U.S. Geological Survey drilled 15 core holes in the Piceance Creek area of western Colorado. This preliminary report presents the basic data gathered during the drilling program. The general location of all the core holes is shown on figure 1; a more precise location is shown on figures 2-14. A summary of core holes data is given in table 1. The wells were drilled with a truck-mounted rig, and the recovered cores were examined at the drill site. A lithologic description of each of the core holes accompanies this report. The purpose of the drilling was to obtain information to aid in the evaluation of the oil-shale resources of the Piceance Creek area. Cores from the drill holes were assayed for oil yield by the Natural Resource Laboratory, Inc. of Lakewood, Colorado, and Laramie Energy Technology Center, Laramie, Wyoming. Histograms showing oil yield and tables giving the analytical results for each core hole accompany this report.

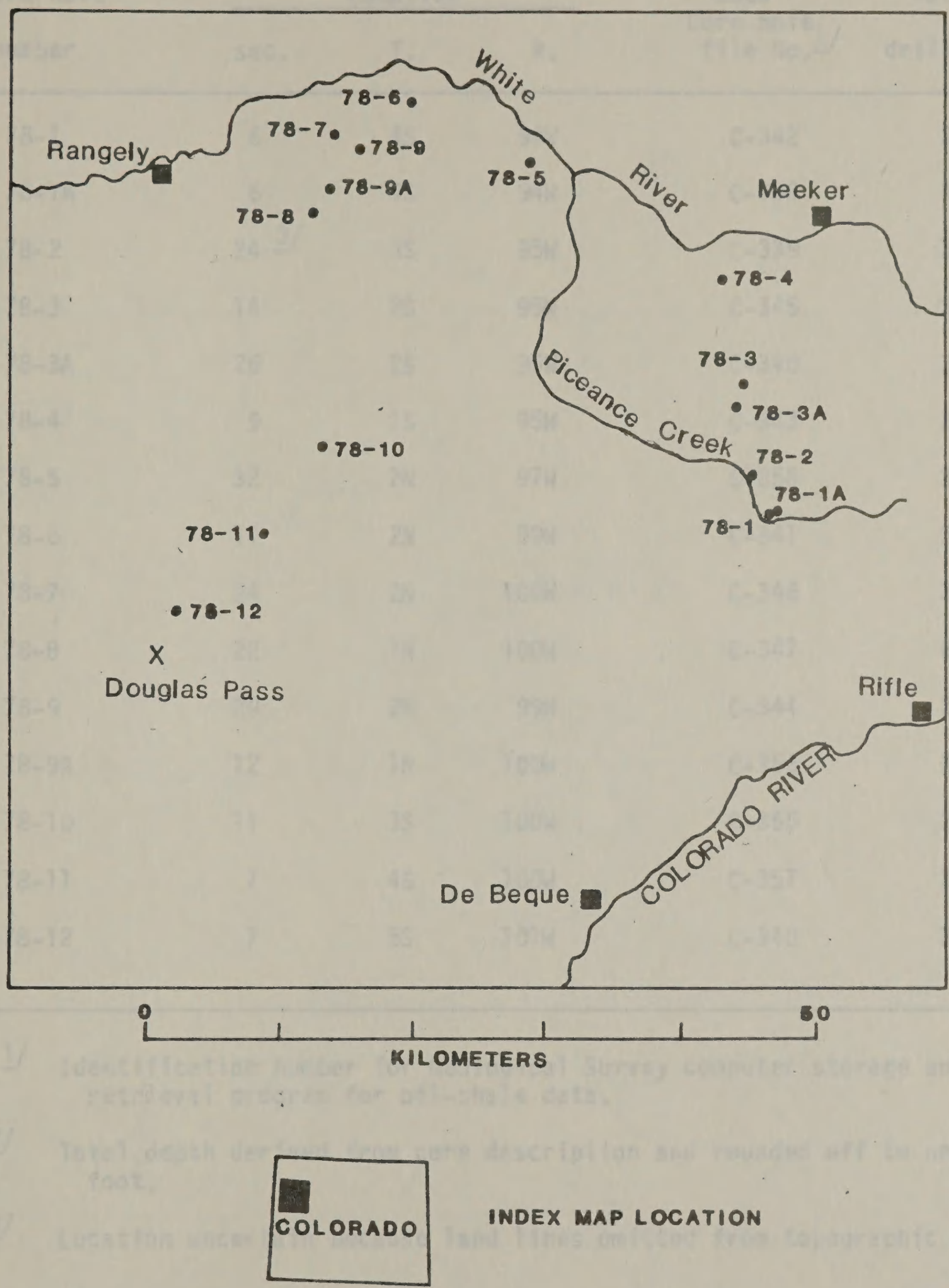


Figure 1.--Index map showing location of core holes drilled in 1978.

Table 1.--Core holes drilled in 1978 in Piceance Creek basin area.

Core hole number	Location sec.	T.	R.	USGS Core hole file No.[1/]	Total depth drilled (feet)[2/]
78-1	6	4S	94W	C-342	232
78-1A	6	4S	94W	C-338	100
78-2	24 [3/]	3S	95W	C-339	307
78-3	14	2S	95W	C-345	303
78-3A	26	2S	95W	C-340	300
78-4	9	1S	95W	C-343	220
78-5	32	2N	97W	C-358	323
78-6	11	2N	99W	C-341	205
78-7	24	2N	100W	C-346	304
78-8	22	1N	100W	C-347	630
78-9	29	2N	99W	C-344	205
78-9A	12	1N	100W	C-356	200
78-10	11	3S	100W	C-355	298
78-11	7	4S	100W	C-357	202
78-12	7	5S	101W	C-348	330

1/ Identification number for Geological Survey computer storage and retrieval program for oil-shale data.

2/ Total depth derived from core description and rounded off to nearest foot.

3/ Location uncertain because land lines omitted from topographic map.

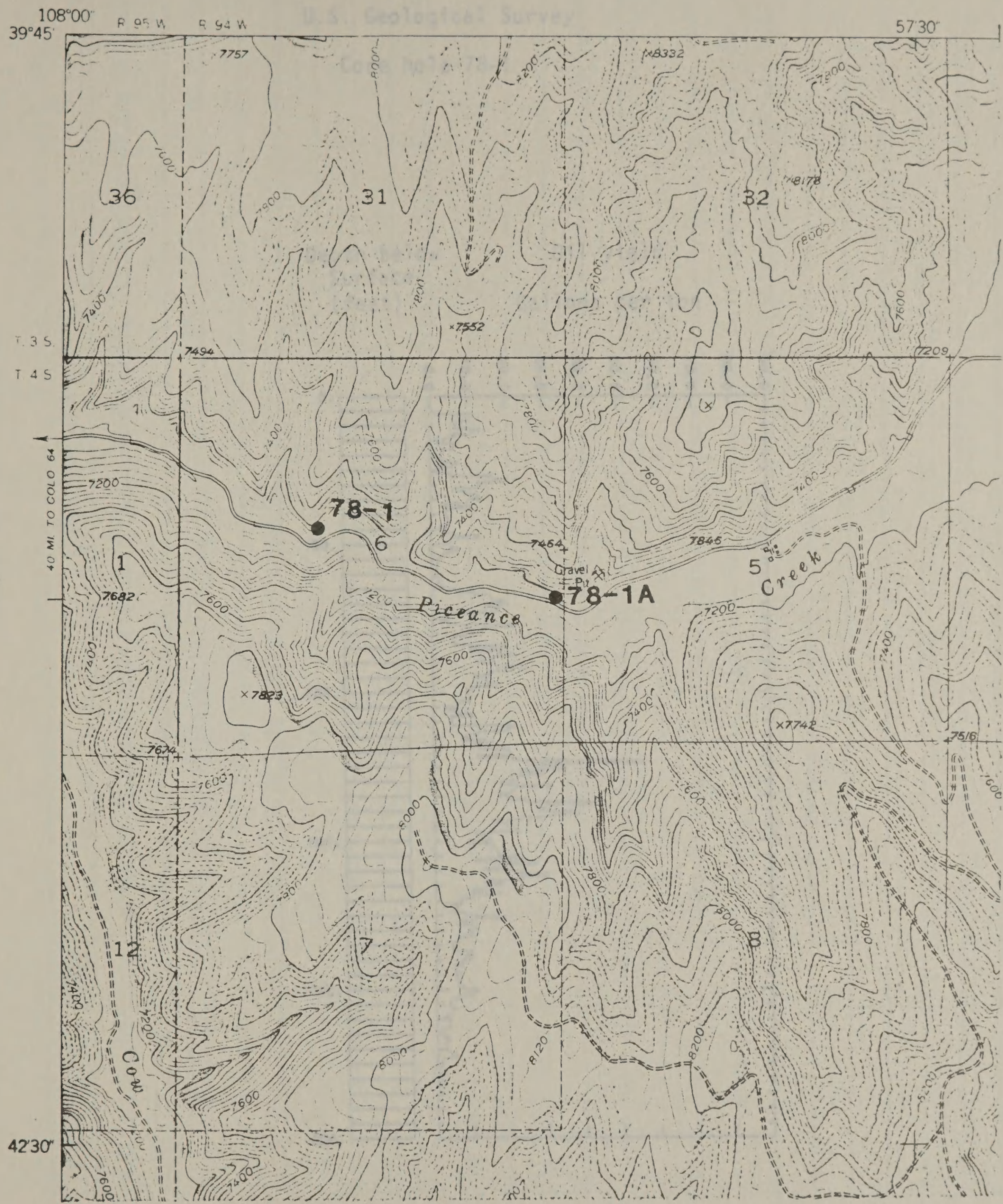
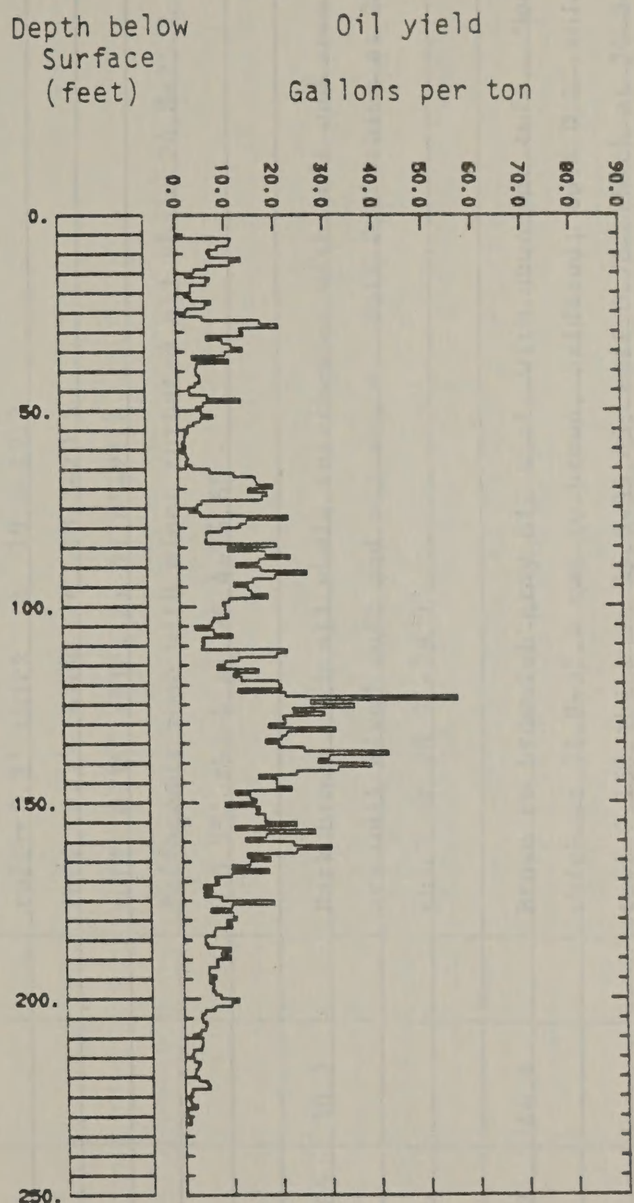


Figure 2.--Map showing location of core holes 78-1 and 78-1A. Base from Rio Blanco Quadrangle (1952). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-1



Corehole 78-1
Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
6.0	26.65		Brown to brownish gray oil shale with minor tuff. Little turbation with thin bedding. Moderately rich.
			tuff ~ 0.15' thick at 14.85-15.0
			tuff 0.15' thick at 15.6-15.75
			18.7-21.5' highly contorted bedding
			tuff ~ 0.2' thick at 19.0-19.3
			tuff 0.3' thick at 20.2-20.5
			tuff 0.35' thick at 21.05-21.4
			Tuffaceous zone with minor turbated oil shale 24.8-25.2, 0.4' thick tuff 0.25' thick at 26.4-26.65
26.65	30.2		Dark brown rich oil shale interbedded with tuff and some leaner oil shale. Parts are well mixed tuff and oil shale. Tuff 0.2' thick at 28.6-28.8'; tuff 0.4' thick at 28.9'-29.3'.
30.2	46.4		Brown to brownish gray oil shale with abundant tuff. Moderately rich. Tuff 0.5' thick at 31.9-32.4 tan to brown, oxidized; tuff 0.1' thick at 32.8-32.9'; tuff 0.15' thick at 35.5-35.65; tuff 0.75' thick at 36.3-37.05; highly tuffaceous zone 38.5-40.9' 2.4' thick, homogenized.

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
46.4	113.1		Dark brown to brown rich oil shale with abundant intermixed tuff. Green and blue
			material in some fractures and in beds, some folding, but generally even bedding
			tuff 0.4'thick at 49.05-49.45
			tuff 0.1' thick at 58.0'
			tuff 0.1' thick at 64.0
			tuff 0.15' thick at 65.3-65.45
			tuff 0.2' thick at 73.2-73.4
			tuff 0.25' thick at 73.7 - 73.95
			tuff at 0.25' thick at 74.05- 74.3
			tuff 0.1' thick at 74.5'
			Sequence of thick tuffs with thin even layers of oil shale between them from
			74.8-77.2. 2.4' thick white tuff 0.15' thick at 77.2-77.35
			Very dark brown to black oil shale with some tuffs.
			77.35-78.1
			Sequence of thick and thin tuffs of different textures with thin interbedded
			dark rich oil shale, 80.9'-86.5', 5.6' thick tuff 0.1' thick at 89.3'
			Tuff 0.2' thick at 92.0-92.2
			Tuff 0.1' thick at 92.8
			Tuff 0.25' thick at 95.0-95.25
			Tuff 0.15' thick at 95.85 - 96.0
			Tuff 0.2' thick at 99.2-99.4 contorted

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.3' thick at 99.9' - 100.2'
			Tuff 0.2' thick at 103.1' - 103.3'
			Tuff 0.4' thick at 103.4' - 103.8'
			Tuff 0.4' thick at 104.4' - 104.8'
			~~Tuffaceous section ~70 percent massive thick to thin tuffs~~
			with interbedded moderately rich to rich oil shale
			105.2'-111.0', 5.8' thick total
~~113.1~~	~~122.6'~~	9.5'	Highly tuffaceous section with ~70 percent tuff ~~interbedded with brown to very~~
			dark brown rich oil shale. Some turbation. Individual tuffs not described
122.6	143.0		Dark brown rich oil shale ~~interbedded with tuff. Little turbation.~~
			~~tuff 0.1' thick at 124.6'~~
			Shallow dipping bedding plane slickensides at 124.9', 125.05, 125.2'
			Tuff 0.1' thick at 126.7'
			Tuff 0.15' thick at 130.1'-130.3'
			Tuff 0.12' thick at 130.6'
			Tuff 0.1' thick at 130.6'
			Tuff 0.1' thick at 130.7'
			Tuff 0.1' thick at 132.3'
			Tuff 0.1' thick at 133.8'

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FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Slickensides in bedding plane at 136.9', 137.05', 138.2', 138.3', 139.6', 139.8',
			139.95', 140.2' 140.7' 141.4', 142.4',
			Tuff 0.1' thick at 138.1
			Tuff 0.5' thick at 140.2'-140.7'
			Tuff 0.1' thick at 141.0'
			Tuff 0.1' thick at 142.0'
			Tuff 0.1' thick at 146.0'
143.0	204.2		Brown to gray brown moderately rich oil shale with several units of rich dark
			brown oil shale, much tuff or silt intermixed with shale, bedding is thin and
			even with little turbation ~70 percent tuff with mixed and discrete oil shale
			layers from 147.5-147.9', 0.4' thick.
			Bedded massive tuff with very thin shale layers from 149.9' - 150.3', 0.4' thick
			Tuff 0.1' thick at 152.3'
			Tuff 0.75' thick at 156.05-156.8 with minor shale
			Tuff 0.1' thick at 158.1'
			Tuff 0.8' thick at 158.7-159.5
			Tuff 0.7' thick at 162.6-163.3 with minor shale
			Tuff 0.1' thick at 166.1'
			Tuff 0.2' thick at 168.3' - 168.5' with minor shale
			Tuff 0.5' thick at 171.6-172.1
			Tuff 0.1' thick at 172.5'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.1' thick at 172.8'
			Tuff 0.1' thick at 174.0'
			Tuff 0.1' thick at 175.5'
			Tuff 0.1' thick at 175.8'
			Tuff 0.35' thick at 177.35-177.7
			Tuff 0.45' thick at 178.75' -179.2'
			Tuff 0.4' thick at 181.6-182.0'
			Highly tuffaceous section with shale mixed with tuff
			and/or silt - 183.9'-187.4', 3.5' thick
			Tuff 0.9' thick at 187.8' 188.7'
			Tuff 0.1' thick at 189.7'
			Tuff 0.15' thick at 194.95-195.1
			Tuff 0.3' thick at 195.3-195.6
			Tuff 0.15' thick at 197.0-197.15
204.2	232.0		Zone of gray siltstone with minor oil shale and probably abundant tuff. The
BOTTOM	OF HOLE		rock retains water in this unit. Thin pyrite rich layers common.
			Tuff 0.1' thick at 207.5'
			Tuff 0.2' thick at 217.4-217.6

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-1 drilled in sec. 6, T 4 S, R 94 W, Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil1/	Water	
6.0	7.0	4.5	1.8	92.5	1.2	11.4	4.3	0.939
7.0	8.0	4.3	1.6	93.0	1.1	11.0	3.8	.938
8.0	9.0	3.4	1.5	93.9	1.2	8.6	3.6	.941
9.0	10.0	2.6	1.2	95.6	.6	6.6	2.9	.934
10.0	11.0	2.7	1.2	95.5	.6	7.1	2.9	.926
11.0	12.0	5.2	1.6	91.9	1.3	13.4	3.8	.932
12.0	13.0	4.3	1.5	92.7	1.5	11.1	3.6	.933
13.0	14.0	2.4	1.2	95.7	.7	6.3	2.9	.926
14.0	15.0	1.5	1.1	97.0	.4	3.8a	2.6	
15.0	16.0	.8	1.0	97.6	.6	2.1a	2.4	
16.0	17.0	2.7	1.1	95.3	.9	7.0	2.6	.931
17.0	18.0	2.4	1.3	95.4	.9	6.2	3.1	.930
18.0	19.0	1.2	1.5	96.7	.6	3.0a	3.6	
19.0	20.0	1.1	1.0	97.2	.7	3.0a	2.4	
20.0	21.0	.7	1.0	97.7	.6	1.8a	2.4	
21.0	22.0	1.2	1.3	96.7	.8	3.1a	3.1	
22.0	23.0	2.8	1.5	94.6	1.1	7.2	3.6	.927
23.0	24.0	2.3	1.6	94.8	1.3	5.9	3.8	.925
24.0	25.0	.8	1.0	97.4	.8	2.1a	2.4	
25.0	26.0	.4	1.9	97.2	.5	1.0a	4.6	
26.0	27.0	2.1	1.2	95.3	1.4	5.4	2.9	.927
27.0	28.0	6.6	1.6	90.4	1.4	17.1	3.8	.930
28.0	29.0	8.0	1.6	88.7	1.7	20.8	3.8	.922
29.0	30.0	5.0	1.7	92.1	1.2	12.9	4.1	.928
30.0	31.0	5.3	1.2	92.0	1.5	13.7	2.9	.925
31.0	32.0	2.3	.9	96.1	.7	6.1	2.2	.925
32.0	33.0	3.6	1.4	93.8	1.2	9.4	3.4	.925
33.0	34.0	4.3	.9	93.6	1.2	11.2	2.2	.924
34.0	35.0	5.2	.7	93.0	1.1	13.5	1.7	.916
35.0	36.0	3.8	1.2	93.4	1.6	9.9	2.9	.919
36.0	37.0	1.2	0.7	97.3	0.8	3.1a	1.7	
37.0	38.0	4.2	1.4	92.9	1.5	10.7	3.4	0.928
38.0	39.0	1.6	1.4	96.4	.6	4.1a	3.4	
39.0	40.0	1.4	1.1	97.0	.5	3.8a	2.6	
40.0	41.0	1.5	1.1	96.5	.9	4.0a	2.6	
41.0	42.0	1.8	1.4	96.3	.5	4.6a	3.4	
42.0	43.0	1.9	1.3	95.8	1.0	4.8a	3.1	
43.0	44.0	1.4	1.4	96.5	.7	3.7a	3.4	
44.0	45.0	.9	1.0	97.6	.5	2.4a	2.4	
45.0	46.0	1.0	1.0	97.5	.5	2.6a	2.4	

Samples from the U.S. Geological Survey's Corehole 78-1 (Continued)

Depth From	Depth To	Yield of product: Weight percent Oil	Weight percent Water	Weight percent Spent shale	Weight percent Gas + loss	Gal per ton Oil 1/	Gal per ton Water	Specific gravity of oil at 60°/60° F
46.0	47.0	2.4	1.1	95.8	.7	6.2	2.6	.927
47.0	48.0	5.0	1.3	92.3	1.4	13.0	3.1	.925
48.0	49.0	2.1	1.0	96.3	.6	5.4	2.4	.927
49.0	50.0	1.5	1.0	96.9	.6	3.9a	2.4	
50.0	51.0	1.9	1.4	96.1	.6	4.9a	3.4	
51.0	52.0	2.8	1.3	95.0	.9	7.3	3.1	.926
52.0	53.0	1.8	1.0	96.4	.8	4.7a	2.4	
53.0	54.0	1.3	1.1	96.9	.7	3.3a	2.6	
54.0	55.0	.8	1.7	97.1	.4	2.0a	4.1	
55.0	56.0	.8	2.0	96.7	.5	2.1a	4.8	
56.0	57.0	.6	1.9	97.0	.5	1.5a	4.6	
57.0	58.0	.6	1.9	97.1	.4	1.4a	4.6	
58.0	59.0	.4	1.7	97.3	.6	1.0a	4.1	
59.0	60.0	.6	2.0	96.7	.7	1.6a	4.8	
60.0	61.0	.4	1.9	97.2	.5	.9a	4.6	
61.0	62.0	.7	1.7	97.2	.4	1.8a	4.1	
62.0	63.0	.8	1.6	97.1	.5	2.1a	3.8	
63.0	64.0	.6	1.1	97.6	.7	1.6a	2.6	
64.0	65.0	1.1	.9	97.7	.3	2.8a	2.2	
65.0	66.0	2.4	1.1	95.7	.8	6.5	2.6	.903
66.0	67.0	4.3	1.3	93.2	1.2	11.4	3.1	0.906
67.0	68.0	5.9	1.4	91.2	1.5	15.7	3.4	.901
68.0	69.0	6.0	1.4	91.2	1.4	16.0	3.4	.904
69.0	70.0	7.2	1.6	89.4	1.8	19.2	3.8	.903
70.0	71.0	5.4	1.7	91.5	1.4	14.3	4.1	.906
71.0	72.0	6.9	1.9	89.5	1.7	18.1	4.6	.911
72.0	73.0	6.5	1.9	89.6	2.0	17.0	4.6	.910
73.0	74.0	1.8	1.6	95.8	.8	4.7a	3.8	
74.0	75.0	1.5	1.7	95.3	1.5	3.6a	4.1	
75.0	76.0	.8	2.2	96.3	.7	2.2a	5.3	
76.0	77.0	1.7	2.4	95.1	.8	4.5a	5.8	
77.0	78.0	8.5	2.8	86.4	2.3	22.3	6.7	.910
78.0	79.0	5.3	1.3	92.3	1.1	13.7	3.1	.917
79.0	80.0	4.7	.7	93.1	1.5	12.5	1.7	.908
80.0	81.0	3.3	1.3	94.5	.9	8.8	3.1	.906
81.0	82.0	2.1	1.7	95.4	.8	5.6	4.1	.915
82.0	83.0	2.1	2.4	95.0	.5	5.6	5.8	.931
83.0	84.0	2.1	2.9	94.5	.5	5.4	7.0	.920
84.0	85.0	7.7	1.2	89.7	1.4	19.9	2.9	.920
85.0	86.0	3.8	1.5	93.9	.8	9.9	3.6	.915
86.0	87.0	6.7	1.7	90.4	1.2	17.5	4.1	.912
87.0	88.0	8.6	1.6	87.9	1.9	22.6	3.8	.912
88.0	89.0	6.3	1.8	90.6	1.3	16.3	4.3	.919
89.0	90.0	4.5	1.8	92.3	1.4	11.6	4.3	.924
90.0	91.0	6.4	1.7	90.8	1.1	16.6	4.1	.922
91.0	92.0	9.9	1.7	86.1	2.3	26.0	4.1	.915
92.0	93.0	7.4	1.7	89.4	1.5	19.5	4.1	.913
93.0	94.0	5.7	1.6	91.5	1.2	15.0	3.8	.917
94.0	95.0	4.3	1.6	93.1	1.0	11.1	3.8	.919
95.0	96.0	5.3	1.8	91.5	1.4	14.0	4.3	.917

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-1 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil[1]	Gal per ton: Water	Specific gravity of oil at 60°/60° F
96.0	97.0	5.6	1.8	91.4	1.2	14.7	4.3	0.914
97.0	98.0	6.9	1.7	89.8	1.6	18.0	4.1	.916
98.0	99.0	3.8	1.0	94.1	1.1	10.1	2.4	.916
99.0	100.0	3.4	2.5	93.1	1.0	8.8	6.0	.925
100.0	101.0	3.5	1.2	94.5	.8	9.3	2.9	.915
101.0	102.0	3.5	.7	94.9	.9	9.2	1.7	.909
102.0	103.0	3.8	1.5	93.7	1.0	9.9	3.6	.916
103.0	104.0	2.7	3.0	93.4	.9	6.9	7.2	.922
104.0	105.0	2.5	1.6	95.2	.7	6.5	3.8	.918
105.0	106.0	1.2	.7	96.8	1.3	3.1a	1.7	
106.0	107.0	2.6	.7	96.2	.5	6.9	1.7	.912
107.0	108.0	4.1	1.2	93.9	.8	10.8	2.9	.915
108.0	109.0	1.7	.9	96.8	.6	4.5a	2.2	
109.0	110.0	1.9	1.9	95.7	.5	5.0a	4.6	
110.0	111.0	1.7	1.7	96.0	.6	4.4a	4.1	
111.0	112.0	8.3	1.7	88.1	1.9	21.8	4.1	.915
112.0	113.0	7.4	1.5	89.8	1.3	19.7	3.6	.906
113.0	114.0	4.5	1.4	92.9	1.2	11.9	3.4	.909
114.0	115.0	3.5	1.3	94.5	.7	9.1	3.1	.910
115.0	116.0	2.8	1.3	95.2	.7	7.5	3.1	.909
116.0	117.0	6.1	1.4	91.3	1.2	16.0	3.4	.908
117.0	118.0	4.2	1.6	93.1	1.1	10.9	3.8	.914
118.0	119.0	4.8	1.6	92.5	1.1	12.5	3.8	.917
119.0	120.0	7.7	1.5	89.4	1.4	20.0	3.6	.917
120.0	121.0	7.8	1.2	88.8	2.2	20.6	2.9	.914
121.0	122.0	4.5	1.5	92.8	1.2	11.7	3.6	.915
122.0	123.0	8.1	1.7	88.4	1.8	21.4	4.1	.909
123.0	124.0	21.3	1.9	72.7	4.1	56.2	4.6	.907
124.0	125.0	10.1	1.3	86.4	2.2	26.4	3.1	.914
125.0	126.0	13.4	.9	83.1	2.6	35.4	2.2	.907
126.0	127.0	8.6	1.4	88.1	1.9	22.7	3.4	0.913
127.0	128.0	11.3	1.3	84.7	2.7	29.3	3.1	.926
128.0	129.0	8.0	1.4	88.7	1.9	20.7	3.4	.925
129.0	130.0	8.2	1.2	88.6	2.0	21.4	2.9	.922
130.0	131.0	6.8	1.0	90.7	1.5	17.9	2.4	.915
131.0	132.0	12.1	1.0	84.5	2.4	31.5	2.4	.919
132.0	133.0	8.3	1.2	88.4	2.1	21.5	2.9	.927
133.0	134.0	7.9	.9	89.5	1.7	20.5	2.2	.921
134.0	135.0	6.6	1.0	91.0	1.4	17.2	2.4	.922
135.0	136.0	7.7	1.1	89.6	1.6	20.0	2.6	.918
136.0	137.0	9.5	.9	87.7	1.9	25.1	2.2	.911
137.0	138.0	16.1	1.0	79.6	3.3	42.2	2.4	.916
138.0	139.0	11.5	1.0	85.2	2.3	30.1	2.4	.914
139.0	140.0	10.6	.9	86.4	2.1	27.9	2.2	.906
140.0	141.0	14.5	.9	81.2	3.4	38.7	2.2	.899

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-1 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
141.0	142.0	11.9	.7	84.3	3.1	31.9	1.7	.897
142.0	143.0	8.8	.5	89.1	1.6	23.5	1.2	.893
143.0	144.0	5.9	.4	92.3	1.4	15.8	1.0	.888
144.0	145.0	7.2	.4	91.3	1.1	19.4	1.0	.885
145.0	146.0	7.2	.6	91.0	1.2	19.3	1.4	.900
146.0	147.0	8.5	.9	89.0	1.6	22.4	2.2	.911
147.0	148.0	4.2	1.1	93.4	1.3	10.9	2.6	.917
148.0	149.0	5.3	1.0	92.2	1.5	14.0	2.4	.908
149.0	150.0	5.8	1.3	91.7	1.2	15.2	3.1	.908
150.0	151.0	3.4	1.3	94.6	.7	8.9	3.1	.921
151.0	152.0	6.1	1.1	91.3	1.5	15.9	2.6	.921
152.0	153.0	5.7	1.0	91.9	1.4	15.0	2.4	.916
153.0	154.0	6.4	1.0	91.2	1.4	17.0	2.4	.911
154.0	155.0	6.4	.9	91.4	1.3	16.9	2.2	.908
155.0	156.0	8.8	1.0	88.5	1.7	23.4	2.4	.902
156.0	157.0	4.1	0.8	94.0	1.1	10.8	1.9	0.903
157.0	158.0	10.2	.9	86.8	2.1	27.1	2.2	.902
158.0	159.0	6.4	.9	91.4	1.3	17.1	2.2	.901
159.0	160.0	4.8	.9	93.0	1.3	12.9	2.2	.903
160.0	161.0	8.7	1.0	88.5	1.8	22.8	2.4	.911
161.0	162.0	11.4	.9	85.7	2.0	30.3	2.2	.898
162.0	163.0	8.8	1.0	88.6	1.6	23.3	2.4	.901
163.0	164.0	5.0	.9	93.2	.9	13.2	2.2	.902
164.0	165.0	6.8	1.0	90.8	1.4	17.9	2.4	.913
165.0	166.0	5.3	1.0	92.4	1.3	13.8	2.4	.919
166.0	167.0	3.9	.8	94.3	1.0	10.1	1.9	.922
167.0	168.0	6.7	1.0	91.0	1.3	17.6	2.4	.914
168.0	169.0	3.9	1.0	93.8	1.3	10.0	2.4	.919
169.0	170.0	2.5	.7	96.1	.7	6.6	1.7	.923
170.0	171.0	2.8	.8	95.7	.7	7.4	1.9	.922
171.0	172.0	1.6	1.0	96.8	.6	4.2a	2.4	
172.0	173.0	2.3	.8	96.1	.8	6.0	1.9	.925
173.0	174.0	1.7	.6	97.1	.6	4.3a	1.4	
174.0	175.0	3.0	.5	95.8	.7	7.9	1.2	.911
175.0	176.0	7.0	1.4	90.3	1.3	18.6	3.4	.904
176.0	177.0	3.8	1.5	93.9	.8	10.0	3.6	.901
177.0	178.0	2.1	2.5	94.1	1.3	5.6	6.0	.906
178.0	179.0	3.9	1.0	94.5	.6	10.2	2.4	.915
179.0	180.0	4.1	.6	94.5	.8	10.9	1.4	.913
180.0	181.0	3.4	.5	95.4	.7	8.8	1.2	.909
181.0	182.0	3.8	.8	94.8	.6	9.9	1.9	.913
182.0	183.0	2.5	.6	96.4	.5	6.4	1.4	.921
183.0	184.0	2.4	.6	96.3	.7	6.3	1.4	.926
184.0	185.0	1.7	.7	96.9	.7	4.4a	1.7	
185.0	186.0	1.7	1.1	96.4	.8	4.4a	2.6	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

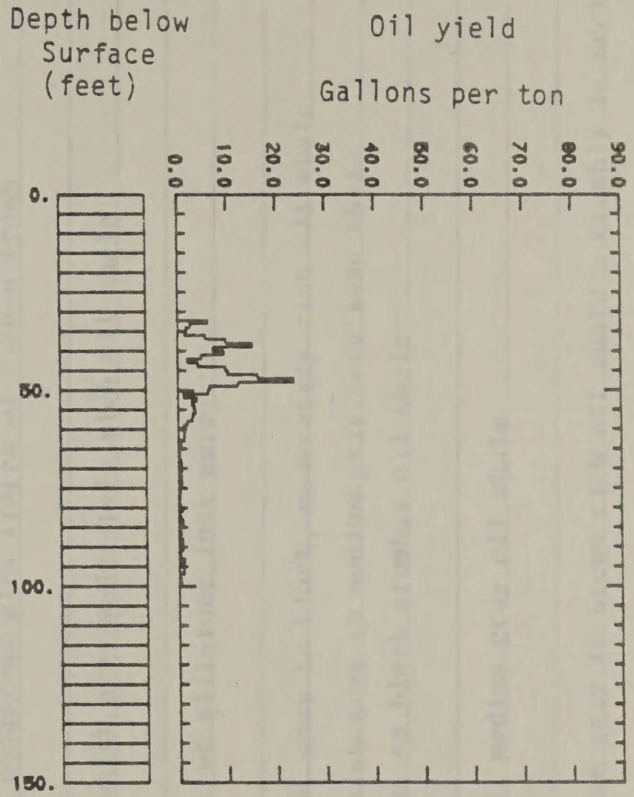
Samples from the U.S. Geological Survey's Corehole 78-1 (Continued)

Depth From	Depth To	Yield of product: Weight percent Oil	Water	Spent shale	Gas + loss	Gal per ton Oil[1/]	Water	Specific gravity of oil at 60°/60° F
186.0	187.0	1.9	1.0	96.5	0.6	4.9a	2.4	
187.0	188.0	3.7	1.7	92.7	.9	9.6	4.1	0.920
188.0	189.0	2.9	2.7	93.5	.9	7.7	6.5	.919
189.0	190.0	3.7	.8	94.4	1.1	9.6	1.9	.920
190.0	191.0	2.6	.4	96.5	.5	6.7	1.0	.923
191.0	192.0	2.7	.7	96.1	.5	7.0	1.7	.926
192.0	193.0	2.0	1.2	96.2	.6	5.1a	2.9	
193.0	194.0	1.9	1.5	95.7	.9	5.1a	3.6	
194.0	195.0	2.6	1.0	95.7	.7	6.6	2.4	.935
195.0	196.0	2.0	1.1	96.0	.9	5.2	2.6	.929
196.0	197.0	2.4	.8	96.1	.7	6.1	1.9	.928
197.0	198.0	2.2	1.1	95.6	1.1	5.8	2.6	.926
198.0	199.0	2.5	1.1	95.5	.9	6.4	2.6	.925
199.0	200.0	2.9	1.3	94.8	1.0	7.5	3.1	.928
200.0	201.0	4.3	1.0	93.2	1.5	11.2	2.4	.914
201.0	202.0	3.7	1.1	93.9	1.3	9.7	2.6	.916
202.0	203.0	2.4	1.0	95.7	.9	6.3	2.4	.916
203.0	204.0	1.6	.4	97.4	.6	4.2a	1.0	
204.0	205.0	1.3	.2	98.0	.5	3.4a	.5	
205.0	206.0	1.4	.5	97.5	.6	3.7a	1.2	
206.0	207.0	1.8	.3	97.3	.6	4.6a	.7	
207.0	208.0	1.6	.1	97.7	.6	4.3a	.2	
208.0	209.0	1.2	.4	97.8	.6	3.2a	1.0	
209.0	210.0	.6	.4	98.5	.5	1.7a	1.0	
210.0	211.0	1.4	.3	97.8	.5	3.7a	.7	
211.0	212.0	1.4	.3	97.8	.5	3.7a	.7	
212.0	213.0	1.3	.2	97.9	.6	3.4a	.5	
213.0	214.0	.7	.1	98.6	.6	1.7a	.2	
214.0	215.0	.5	.2	98.7	.6	1.4a	.5	
215.0	216.0	.7	.2	98.7	.4	1.9a	.5	
216.0	217.0	1.2	0.3	97.7	0.8	3.1a	0.7	
217.0	218.0	1.0	.2	98.3	.5	2.6a	.5	
218.0	219.0	.8	.1	98.6	.5	2.1a	.2	
219.0	220.0	.8	.4	98.2	.6	2.0a	1.0	
220.0	221.0	1.1	.6	97.8	.5	2.8a	1.4	
221.0	222.0	1.8	1.2	96.2	.8	4.6a	2.9	
222.0	223.0	1.9	.6	96.7	.8	5.1a	1.4	
223.0	224.0	.5	.3	98.8	.4	1.4a	.7	
224.0	225.0	.5	.2	98.7	.6	1.2a	.5	
225.0	226.0	.4	.2	99.2	.2	.9a	.5	
226.0	227.0	.5	.3	98.7	.5	1.2a	.7	
227.0	228.0	.9	.3	98.2	.6	2.4a	.7	
228.0	229.0	.2	.3	99.3	.2	.4a	.7	
229.0	230.0	.2	.2	99.3	.3	.4a	.5	
230.0	231.0	.4	.4	98.9	.3	1.0a	1.0	
231.0	232.0	.4	.4	98.8	.4	1.1a	1.0	

1/ "a"--indicates specific gravity estimated as 0.92.

U.S. Geological Survey

Core hole 78-1A



Corehole 78-1A
Logged by Robert Johnston

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
32.2	37.0		Light gray very low grade shale
37.0	39.0		Medium gray moderately rich oil shale
39.0	39.2		Tan sandstone with traces of carbon trash
39.2	39.4		Brownish gray moderately rich oil shale
39.4	39.6		Tuff or siltstone (not sure)
39.6	41.3		Light gray to black, moderately rich oil shale
41.3	43.5		Whitish gray to medium gray very lean shale
43.5	46.5		Brown to black crumbly oil shale
46.5	48.7		Hard, medium gray oil shale
48.7	50.9		Medium gray to brown rich oil shale - crumbly in sections
50.9	51.3		Light brown shale marbled with coarse grain silt
51.3	52.0		Light gray lean oil shale - hard
52.0	52.4		Tuff - numerous dingy white layers of coarse grained material.

Corehole 78-1A (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
52.4	62.5		Hard, light gray, lean oil shale
62.5	62.7		Tuff - dingy white coarse grained layer
62.7	72.4		Hard, light gray, lean oil shale
72.4	77.8		Hard, more heavily banded, light gray oil shale (lean)
77.8	80.0		Tuff
80.0	90.4		Light gray moderately rich oil shale with intermittent zones of crumbly water absorbent shale.
90.4	93.0		Intermingled tuff layers with moderately rich oil shale
93.0	100.2		Gray, lean oil shale.

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-1A drilled in sec. 6, T 4 S, R. 94 W., Rio Blanco County, Colorado

Depth From–To	Yield of product: Weight percent Oil	Water	Spent shale	Gas + loss	Gal per ton Oil 1/	Water	Specific gravity of oil at 60°/60° F
32.2-33.0	2.3	2.5	93.5	1.7	6.1	6.0	0.923
33.0-34.0	1.0	2.1	96.1	.8	2.5a	5.0	
34.0-35.0	.7	1.3	96.8	1.2	1.8a	3.1	
35.0-36.0	.6	1.5	97.5	.4	1.5a	3.6	
36.0-37.0	2.2	2.2	94.7	.9	5.7	5.3	.913
37.0-38.0	3.8	2.6	92.3	1.3	9.8	6.2	.916
38.0-39.0	5.8	3.6	88.8	1.8	15.2	8.6	.912
39.0-40.0	2.7	4.7	91.6	1.0	7.1	11.3	.916
40.0-41.0	3.6	2.7	92.5	1.2	9.4	6.5	.923
41.0-42.0	1.8	2.3	95.3	.6	4.8a	5.5	
42.0-43.0	.8	2.6	96.1	.5	2.0a	6.2	
43.0-44.0	1.6	4.2	93.1	1.1	4.1a	10.1	
44.0-45.0	3.7	5.5	89.6	1.2	9.7	13.2	.907
45.0-46.0	3.8	5.5	89.4	1.3	10.2	13.2	.907
46.0-47.0	6.1	3.3	88.8	1.8	16.3	7.9	.903
47.0-48.0	8.9	3.1	85.8	2.2	23.6	7.4	.907
48.0-49.0	4.7	2.9	90.9	1.5	12.2	7.0	.924
49.0-50.0	2.5	2.8	93.6	1.1	6.4	6.7	.922
50.0-51.0	2.3	2.6	94.2	.9	6.1	6.2	.915
51.0-52.0	.5	1.6	97.4	.5	1.2a	3.8	
52.0-53.0	1.5	2.1	95.9	.5	3.8a	5.0	
53.0-54.0	1.1	1.9	96.5	.5	2.8a	4.6	
54.0-55.0	1.3	2.4	95.6	.7	3.3a	5.8	
55.0-56.0	1.3	2.8	95.1	.8	3.5a	6.7	
56.0-57.0	1.1	3.0	95.2	.7	3.0a	7.2	
57.0-58.0	1.1	2.9	94.9	1.1	2.8a	7.0	
58.0-59.0	.7	3.0	95.2	1.1	1.8a	7.2	
59.0-60.0	.5	2.8	96.1	.7	1.2a	6.7	
60.0-61.0	.5	2.9	96.1	.5	1.3a	7.0	
61.0-62.0	.5	3.0	96.0	.5	1.3a	7.2	
62.0-63.0	0.5	1.6	97.5	0.4	1.2a	3.8	
63.0-64.0	.0	2.1	97.4	.5	.1a	5.0	
64.0-65.0	.2	2.2	97.3	.3	.5a	5.3	
65.0-66.0	.0	2.1	97.4	.5	Trace	5.1	
66.0-67.0	.1	2.3	97.0	.6	.2a	5.5	
67.0-68.0	.1	1.9	97.3	.7	.3a	4.6	
68.0-69.0	.2	1.9	97.4	.5	.6a	4.6	
69.0-70.0	.1	2.1	96.7	1.1	.4a	5.0	
70.0-71.0	.2	2.1	96.9	.8	.6a	5.0	
71.0-72.0	.2	2.0	97.0	.8	.5a	4.8	
72.0-73.0	.2	2.2	96.9	.7	.6a	5.3	
73.0-74.0	.2	2.3	96.8	.7	.6a	5.5	
74.0-75.0	.2	2.4	97.0	.4	.4a	5.8	
75.0-76.0	.1	2.6	96.8	.5	.3a	6.2	
76.0-77.0	.1	2.1	97.4	.4	.2a	5.0	
77.0-78.0	.1	2.1	97.2	.6	.2a	5.0	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-1A (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
78.0-79.0	.0	2.3	96.8	.9	Trace	5.5	
79.0-80.0	.1	1.9	97.0	1.0	.3a	4.6	
80.0-81.0	.3	2.2	96.9	.6	.7a	5.3	
81.0-82.0	.0	2.2	96.8	1.0	Trace	5.2	
82.0-83.0	.1	2.7	96.7	.5	.3a	6.5	
83.0-84.0	.3	2.7	96.5	.5	.8a	6.5	
84.0-85.0	.2	2.9	96.4	.5	.4a	7.0	
85.0-86.0	.0	2.8	96.5	.7	Trace	6.6	
86.0-87.0	.1	2.9	96.4	.6	.4a	7.0	
87.0-88.0	.0	2.8	96.7	.5	Trace	6.6	
88.0-89.0	.3	2.8	96.6	.3	.8a	6.7	
89.0-90.0	.1	2.7	96.6	.6	.4a	6.5	
90.0-91.0	.3	2.6	96.3	.8	.7a	6.2	
91.0-92.0	.1	2.9	96.6	.4	.3a	7.0	
92.0-93.0	0.1	2.7	96.6	0.6	0.3a	6.5	
93.0-94.0	.4	3.3	95.8	.5	1.1a	7.9	
94.0-95.0	.3	3.5	95.4	.8	.7a	8.4	
95.0-96.0	.4	3.1	96.0	.5	1.0a	7.4	
96.0-97.0	.4	3.3	95.7	.6	1.0a	7.9	
97.0-98.0	.0	2.6	96.8	.6	.1a	6.2	
98.0-99.0	.1	2.5	96.5	.9	.4a	6.0	
99.0-100.2	.0	3.0	96.4	.6	.1a	7.2	

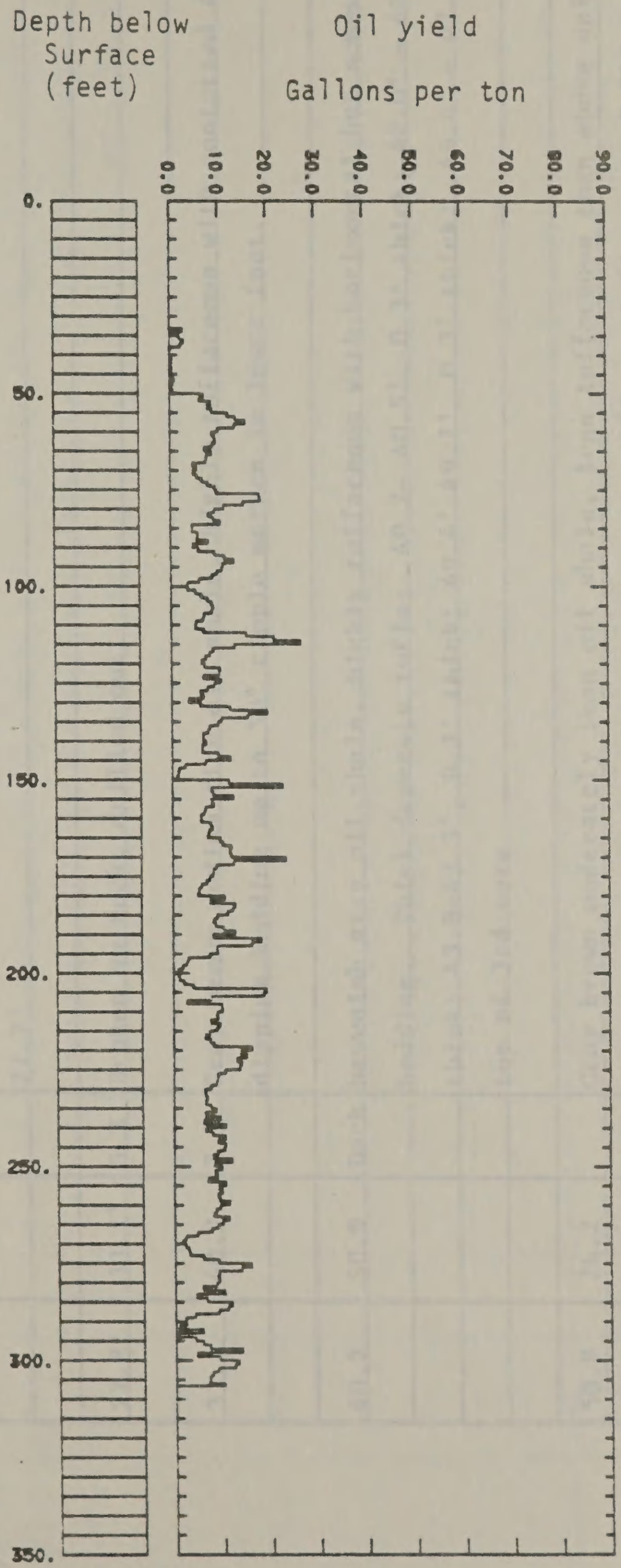
"--indicates specific gravity estimated as 0.92.

Figure 3.--Map showing location of core hole 78-2. Base from No Name Ridge Quadrangle (1952). Scale 1:24,000.

Figure 3.--Map showing location of core hole 78-2. Base from 7½' Mesa Ridge Quadrangle (1965). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-2



Corehole 78-2
Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
23.4	27.8	4.4	Lean medium gray partly weathered oil shale, upper part thinly bedded with dips of up to 50°, lower part highly turbated and folded. Tuff 0.2' thick at 27.5' to 27.7'
27.8'	33.1'	5.3	Broken up rock, drilled out
33.1	-40.2	7.1	Gray brown medium rich oil shale, highly tuffaceous with contorted and steeply dipping bedding up to 50° ripple markes in lower foot.
40.2	50.9	Dark	brownish gray oil shale, highly tuffaceous with horizontal but somewhat disturbed bedding. Thick descrete tuffs: 40.2- 40.5', 0.3' thick; 42.0' - 42.9', 0.9' thick; 43.0-43.3', 0.3' thick; 49.4' 49.7', 0.3' thick; 46.4' - 47.25 lost at top of 3rd core
50.9	76.2		Gray brown moderately lean oil shale, less tuffaceous than above units. Even, horizontal, but turbated bedding tuff 0.05' at 53.8'; tuff 0.05' at 56.6' Rich brown oil shale from 56.8' - 59.7'
76.2	79.1		Dark brownish gray moderately rich oil shale, interbedded with minor tuff. Tuff 0.05' thick at 77.4'
79.1	115.1		Same as interval 50.9-76.2' - tuff 0.05' thick at 88.1'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
115.1	117.0		Rich oil shale with tuff, thinly bedded, little turbation tuff 0.05' thick at 118.1. Some leaner oil shale mixed in.
117.0	150.7		Same as interval 50.9- - 76.2'. Tuff 0.05' thick at 119.2; Rich oil shale dark brown 0.1' thick at 132.7'; rich oil shale 132.3 - 133.6 interbedded with moderately rich oil shale and tuff. Tuff 0.05' thick at 135.0'. Rich oil shale 143.6' - 144.4' with tuff.
150.7-	151.5		Rich dark brown thinly bedded oil shale.
151.5	156.4		Medium rich oil shale thinly bedded with moderate turbation. Tuff 0.05' thick at 153.3'. Tuff, turbated 0.05' thick at 154.2'. Tuff turbated 0.05' thick at 156.0'.
156.4	170.2		Same as interval 50.9'-76.2' medium grade oil shale. Tuff with minor oil shale 0.1' thick at 158.3'. Tuff with minor oil shale 0.4' thick 159.8-160.2'. Tuff, turbated 0.05' thick at 160.9', Tuff 0.5' thick at 164.6' and 164.7' and 165.9' and 168.3' and 170.2'.
170.2	171.7		Dark brown rich oil shale with abundant tuff. Tuff 0.15' thick at 170.9-171.05'
171.7	191.3		Medium rich oil shale, thinly bedded with little turbation./Tuffs common. Tuff 0.2' thick 179.3-179.5; tuff 0.1' thick at 181.2; tuff 0.1' thick at 181.3; tuff 0.2' thick at 185.0-185.2; tuff 0.3' thick at 187.3-187.6.

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
191.3	192.5		Rich dark brown oil shale interbedded with pink and gray tuff. Tuff 0.05' thick at 192.2'
192.5	208.1		Medium rich brown to gray brown oil shale, thinly bedded with little turbation. Tuffs very common. Tuff 0.07' thick at 195.3; tuff with minor oil shale 0.2' thick at 196.1- 196.3. Tuff 0.06' thick at 196.9'; tuff 0.05' thick at 197.5; tuff 0.05' thick at 197.6; Tuff 0.15' thick from 198.0-198.15; tuff 0.05' thick at 198.3; tuff 0.05' thick at 198.4; tuff 0.05' thick at 198.5; tuff 0.1' thick at 199.0; tuff 0.2' thick at 199.2'- 199.4'; rich oil shale, dark brown interbedded with tuff 204.2'-205.5'. Tuff 0.15' thick 205.05-205.2; tuff 0.06' thick at 207.0; thick tuff with minor oil shale toward top 0.8' thick from 207.3-208.1'.
208.1	217.1		Dark brown rich oil shale thinly bedded wtih little turbation. Tuff 0.05' thick at 212.7' tuff 0.07' thick at 213.5'; tuff 0.05' thick at 215.5'; tuff 0.08' thick at 216.3; tuff 0.1' thick at 217.0.
217.1	256.4		Brown, dark gray brown, moderately rich oil shale with turbation in parts. Horizontal thin bedding with abundant tuff. Tuff 0.05' thick at 217.6; tuff 0.1 thick at 218.8'; tuff 0.2' thick at 219.1-219.3'; tuff 0.4' thick at 220.6-220.9'; Turbated tuff 0.1' thick at 227.0' tuff 0.07' thick at 230.0'; turbated tuff 0.2' thick at 230.8-231.0; tuff 0.15' thick at 231.2-231.35; tuff 0.08' thick at 232.3'; tuff0.08' thick at 232.8'; tuff 0.06' thick at 232.9'; tuff 0.1' thick at 233.4'; tuff 0.15' thick at 233.5 to 233.65'; tuff 0.05' thick at 233.7; tuff 0.09' at 234.0; tuff 0.07 thick at 234.5; tuff 0.05' thick at 234.9'; tuff 0.08'

Corehole 78-2 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			thick at 235.7'; tuff 0.2' thick at 235.85-236.05; tuff 0.1' thick at 236.0; tuff 0.15' thick at 236.6-236.75' tuff 0.25'- thick at 236.9' - 237.15'; tuff 0.2' thick at 237.9-238.1 with minor oil shale; tuff 0.35 thick at 238.1-238.45' Tuff turbated with oil shale from 238.6-239.4, 0.8' thick. Tuff, largely massive from 239.4 - 241.4; 2.0' thick. Tuff 0.1' thick at 241.5' tuff 0.05 thick at 241.6' tuff 0.05 thick at 241.7; tuff 0.15 thick at 241.8-241.95. tuff 0.08' thick at 243.7; tuff 0.05' thick at 244.8'; tuff 0.05' thick at 245.4' tuff 0.15' thick at 246.7-246.85'; tuff 0.2' thick at 248.4-248.6' tuff 0.12' thick at 248.7-248.82; tuff 0.25' thick at 249.65-249.9'; tuff 0.05' thick at 250.4'; tuff 0.2' thick at 251.2-251.4 with minor bedded shale; tuff 0.2' thick at 252.3 - 252.5 with minor bedded shale; tuff 0.08' thick at 252.7; tuff 0.1' thick at 253.1'; tuff 0.15' thick at 253.2-253.35; tuff 0.05' thick at 253.8';tuff 0.05' thick at 255.3; tuff 0.15' thick at 256.3' - 256.45'
256.4	264.7		Dark brown rich oil shale with abundant tuff and some leaner oil shale. Thinly bedded with little turbation. Tuff 0.15' thick at 257.25-257.4. Six or more tuffs, tuff ~70 percent oil shale ~30 percent 257.5-258.1; Tuff 0.4' thick at 258.35 - 258.75 with minor oil shale; tuff 0.7' thick at 259.3-260.0 with minor oil shale; tuff 0.1' thick at 260.1' ; tuff 0.08' thick at 263.4'; tuff 0.1' thick at 263.7';

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
264.7	278.2		Brown to gray brown moderately rich oil shale, thinly bedded with little turbation. Tuffs abundant. Tuff 0.07' thick at 265.5'; tuff 0.12' thick at 266.8'; tuff 0.08' thick at 268.4'; 50 percent thin tuffs from 268.6-270.9; tuff 0.06' thick at 273.2'; tuff 0.1' thick at 274.2'; 275.3'-276.7' rich brown oil shale interbedded with tuff and leaner oil shale. Tuff 0.15' thick at 277.45-277.6' with minor shale.
278.2	306.6		Brown to dark brown oil shale, rich, thinly bedded with generally little turbation. Abundant tuff, some leaner oil shale; tuff 0.05' thick at 279.4'; tuff 0.05' thick at 280.9'; tuff 0.3' thick at 281.6-281.9'; tuff 0.15' thick at 282.7 - 282.85'; tuff 0.1' thick at 283.0-283.1; tuff 0.2; thick at 283.15-283.35; tuff 0.3' thick at 283.4-283.7; tuff 0.55' thick at 283.95-284.5; tuff 0.15' thick at 283.6-283.75; ≈50 percent numerous tuffs interbedded with and turbated with oil shale 284.8 - 287.3'; ~~Tuff 287.5-292.3' with minor oil shale in upper foot 4.8' thick total; tuff 0.2'~~ thick with minor ~~shale, turbated from 292.5-292.7; tuff 292.85 - 294.5, 1.65' thick; ≈70 percent tuff, 30 percent oil shale from 294.5 - 295.0; tuff pink and gray from 295.0-296.7, 1.7' thick;~~ tuff 0.1' thick at 297.0; tuff 0.15' thick at 297.1-297.25: tuff 0.1' thick at 297.5; tuff 0.75' thick at 298.35-299.1; tuff 0.2' thick at 299.15-299.35; ~~tuff 0.15 thick at 299.5-299.65;~~ tuff 0.08' thick at 300.05-300.13; tuff 0.1' thick at 301.0' pinkish tan color, no gray; tuff 0.5' thick at 301.8-302.3'.
BOTTOM	OF HOLE		

... MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-2 drilled in sec. 24, T. 3 S., R. 95 W., Rio Blanco County, Colorado

Depth From–To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil 1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
33.1-34.0	1.0	1.2	97.1	0.7	2.7a	2.9	0.920
34.0-35.0	.2	3.2	96.1	.5	.5a	7.7	.920
35.0-36.0	.8	1.4	97.2	.6	2.0a	3.4	.920
36.0-37.0	1.1	1.8	96.1	1.0	2.9a	4.3	.920
37.0-38.0	.8	1.8	96.6	.8	2.2a	4.3	.920
38.0-39.0	.0	1.9	97.6	.5	.1a	4.6	.920
39.0-40.0	.0	1.8	97.7	.5	Trace	4.3	.920
40.0-41.0	.1	2.7	96.6	.6	.2a	6.5	.920
41.0-42.0	.2	1.9	96.3	1.6	.5a	4.6	.920
42.0-43.0	.1	2.5	96.9	.5	.2a	6.0	.920
43.0-44.0	.2	1.6	97.7	.5	.4a	3.8	.920
44.0-45.0	.2	1.3	97.1	1.4	.4a	3.1	.920
45.0-46.0	.2	2.0	97.1	.7	.6a	4.8	.920
46.0-47.0	.4	2.2	96.7	.7	.9a	5.3	.920
47.0-48.0	.3	1.6	97.5	.6	.7a	3.8	.920
48.0-49.0	.2	1.8	97.5	.5	.6a	4.3	.920
49.0-50.0	.3	2.9	96.2	.6	.7a	7.0	.920
50.0-51.0	2.7	2.6	93.7	1.0	7.0	6.2	.926
51.0-52.0	2.4	2.5	94.3	.8	6.2	6.0	.926
52.0-53.0	3.3	2.1	93.5	1.1	8.5	5.0	.931
53.0-54.0	3.0	2.2	93.4	1.4	7.8	5.3	.928
54.0-55.0	3.3	2.7	92.9	1.1	8.7	6.5	.920
55.0-56.0	4.5	2.6	91.6	1.3	11.9	6.2	.919
56.0-57.0	5.2	2.6	90.6	1.6	13.6	6.2	.920
57.0-58.0	6.0	2.6	89.6	1.8	15.5	6.2	.923
58.0-59.0	5.1	2.3	91.2	1.4	13.3	5.5	.924
59.0-60.0	3.8	2.3	92.4	1.5	9.9	5.5	.929
60.0-61.0	3.3	2.7	92.8	1.2	8.6	6.5	.927
61.0-62.0	3.6	2.3	93.0	1.1	9.2	5.5	.925
62.0-63.0	3.6	2.1	93.1	1.2	9.4	5.0	.922
63.0-64.0	3.3	1.3	94.4	1.0	8.7	3.1	0.921
64.0-65.0	2.7	.8	95.6	.9	7.1	1.9	.917
65.0-66.0	3.3	.8	94.6	1.3	8.5	1.9	.920
66.0-67.0	2.9	1.3	94.9	.9	7.5	3.1	.924
67.0-68.0	2.9	2.0	94.4	.7	7.4	4.8	.931
68.0-69.0	1.8	1.9	95.8	.5	4.6a	4.6	.920
69.0-70.0	2.1	1.9	95.3	.7	5.5	4.6	.927
70.0-71.0	1.8	1.9	95.7	.6	4.7a	4.6	.920
71.0-72.0	2.1	2.1	95.1	.7	5.5	5.0	.925
72.0-73.0	2.5	1.8	94.9	.8	6.6	4.3	.923
73.0-74.0	3.0	2.1	93.9	1.0	7.8	5.0	.922
74.0-75.0	3.5	2.0	93.2	1.3	9.2	4.8	.924
75.0-76.0	3.6	2.0	93.1	1.3	9.5	4.8	.921
76.0-77.0	7.1	2.1	89.4	1.4	18.4	5.0	.925
77.0-78.0	7.2	1.8	89.2	1.8	18.6	4.3	.926
78.0-79.0	5.8	1.4	91.6	1.2	15.0	3.4	.920
79.0-80.0	4.2	2.1	92.4	1.3	10.9	5.0	.924

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-2 (Continued)

Depth From-To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil1/	Water	Specific gravity of oil at 60°/60° F
80.0-81.0	3.5	1.7	93.5	1.3	9.0	4.1	.920
81.0-82.0	3.0	1.5	94.5	1.0	7.8	3.6	.924
82.0-83.0	3.4	3.0	92.2	1.4	8.8	7.2	.930
83.0-84.0	3.9	2.9	91.9	1.3	10.2	7.0	.928
84.0-85.0	1.7	1.7	96.0	.6	4.4a	4.1	.920
85.0-86.0	1.7	1.6	96.1	.6	4.4a	3.8	.920
86.0-87.0	2.2	1.9	95.4	.5	5.6	4.6	.926
87.0-88.0	2.1	1.8	95.6	.5	5.4	4.3	.933
88.0-89.0	3.0	1.7	94.7	.6	7.8	4.1	.931
89.0-90.0	1.8	1.5	96.1	.6	4.6a	3.6	.920
90.0-91.0	2.2	1.7	95.6	.5	5.7	4.1	.931
91.0-92.0	3.5	2.3	93.3	.9	9.1	5.5	.932
92.0-93.0	4.3	2.5	92.0	1.2	11.1	6.0	.932
93.0-94.0	5.0	2.2	91.6	1.2	13.0	5.3	0.928
94.0-95.0	4.1	2.0	92.7	1.2	10.7	4.8	.925
95.0-96.0	4.0	1.8	93.1	1.1	10.5	4.3	.920
96.0-97.0	3.6	1.9	93.5	1.0	9.5	4.6	.916
97.0-98.0	3.2	2.0	93.7	1.1	8.5	4.8	.914
98.0-99.0	2.2	2.1	94.9	.8	5.8	5.0	.916
99.0-100.0	1.3	2.6	95.6	.5	3.4a	6.2	.920
100.0-101.0	1.3	2.6	95.6	.5	3.4a	6.2	.920
101.0-102.0	2.0	2.5	94.8	.7	5.1a	6.0	.920
102.0-103.0	2.4	2.5	94.4	.7	6.3	6.0	.928
103.0-104.0	2.9	2.1	94.0	1.0	7.6	5.0	.921
104.0-105.0	3.2	2.1	93.5	1.2	8.4	5.0	.917
105.0-106.0	3.4	2.1	93.2	1.3	8.7	5.0	.919
106.0-107.0	3.2	2.5	93.1	1.2	8.4	6.0	.921
107.0-108.0	2.6	2.4	94.0	1.0	6.8	5.8	.920
108.0-109.0	2.6	2.1	94.6	.7	6.6	5.0	.926
109.0-110.0	2.0	1.7	95.5	.8	5.1	4.1	.931
110.0-111.0	1.9	1.6	95.8	.7	4.9a	3.8	.920
111.0-112.0	2.6	1.8	94.7	.9	6.7	4.3	.926
112.0-113.0	5.9	1.7	91.0	1.4	15.5	4.1	.919
113.0-114.0	8.2	1.9	87.5	2.4	21.3	4.6	.923
114.0-115.0	10.2	1.7	85.5	2.6	26.7	4.1	.917
115.0-116.0	5.0	1.7	92.1	1.2	13.0	4.1	.918
116.0-117.0	3.3	1.9	93.8	1.0	8.6	4.6	.922
117.0-118.0	3.1	2.1	93.9	.9	7.9	5.0	.925
118.0-119.0	2.7	2.2	94.3	.8	7.0	5.3	.923
119.0-120.0	2.4	2.6	94.3	.7	6.2	6.2	.922
120.0-121.0	2.6	2.2	94.3	.9	6.8	5.3	.919
121.0-122.0	3.8	1.6	93.5	1.1	10.0	3.8	.919
122.0-123.0	3.7	1.8	93.3	1.2	9.8	4.3	.918

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-2 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
123.0-124.0	2.5	1.8	94.5	1.2	6.6	4.3	0.922
124.0-125.0	4.0	2.0	92.6	1.4	10.3	4.8	.918
125.0-126.0	3.4	2.0	92.7	1.9	8.8	4.8	.923
126.0-127.0	2.9	2.5	93.6	1.0	7.4	6.0	.924
127.0-128.0	2.3	2.7	93.9	1.1	5.9	6.5	.924
128.0-129.0	2.5	2.3	94.2	1.0	6.6	5.5	.930
129.0-130.0	1.3	1.7	96.4	.6	3.5a	4.1	.920
130.0-131.0	2.3	1.6	95.3	.8	6.0	3.8	.922
131.0-132.0	4.6	1.8	92.3	1.3	12.1	4.3	.916
132.0-133.0	7.6	1.7	88.5	2.2	19.7	4.1	.922
133.0-134.0	6.0	2.1	90.4	1.5	15.7	5.0	.921
134.0-135.0	4.0	1.8	93.1	1.1	10.2	4.3	.929
135.0-136.0	3.7	1.9	93.3	1.1	9.5	4.6	.934
136.0-137.0	3.1	2.0	94.0	.9	7.8	4.8	.941
137.0-138.0	2.9	2.4	93.3	1.4	7.4	5.8	.939
138.0-139.0	2.5	2.4	94.3	.8	6.4	5.8	.939
139.0-140.0	2.5	2.3	94.1	1.1	6.4	5.5	.936
140.0-141.0	2.7	2.0	94.2	1.1	7.0	4.8	.935
141.0-142.0	2.4	1.6	94.9	1.1	6.2	3.8	.935
142.0-143.0	2.4	1.6	94.9	1.1	6.3	3.8	.928
143.0-144.0	3.7	2.1	92.7	1.5	9.5	5.0	.920
144.0-145.0	4.6	2.2	91.4	1.8	12.0	5.3	.921
145.0-146.0	2.6	1.9	94.3	1.2	6.9	4.6	.914
146.0-147.0	1.0	1.6	96.6	.8	2.7a	3.8	.920
147.0-148.0	.5	1.6	97.1	.8	1.4a	3.8	.920
148.0-149.0	.5	1.6	97.1	.8	1.3a	3.8	.920
149.0-150.0	.4	1.5	97.4	.7	1.0a	3.6	.920
150.0-151.0	4.5	2.1	91.6	1.8	11.7	5.0	.923
151.0-152.0	8.9	2.0	87.0	2.1	22.8	4.8	.936
152.0-153.0	3.1	2.3	93.4	1.2	8.0	5.5	.933
153.0-154.0	3.3	2.7	92.8	1.2	8.4	6.5	0.935
154.0-155.0	4.9	2.0	91.5	1.6	12.6	4.8	.936
155.0-156.0	3.1	2.0	93.5	1.4	8.0	4.8	.932
156.0-157.0	3.3	1.9	93.5	1.3	8.5	4.6	.932
157.0-158.0	2.6	1.5	94.8	1.1	6.8	3.6	.928
158.0-159.0	2.5	1.3	95.1	1.1	6.5	3.1	.927
159.0-160.0	2.2	1.4	95.2	1.2	5.8	3.4	.927
160.0-161.0	2.3	1.6	95.1	1.0	5.9	3.8	.927
161.0-162.0	3.1	1.6	94.1	1.2	7.9	3.8	.929
162.0-163.0	3.2	2.2	93.4	1.2	8.2	5.3	.928
163.0-164.0	2.9	2.1	93.8	1.2	7.5	5.0	.924
164.0-165.0	2.8	1.8	94.2	1.2	7.3	4.3	.916
165.0-166.0	3.7	1.8	92.9	1.6	9.8	4.3	.914
166.0-167.0	4.0	1.8	92.6	1.6	10.3	4.3	.916
167.0-168.0	4.6	2.6	91.1	1.7	12.1	6.2	.915
168.0-169.0	4.5	1.9	92.0	1.6	11.7	4.6	.921
169.0-170.0	4.6	1.9	91.6	1.9	12.1	4.6	.918

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-2 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil 1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
170.0-171.0	9.0	2.2	86.3	2.5	23.4	5.3	.921
171.0-172.0	4.9	2.2	90.8	2.1	12.6	5.3	.929
172.0-173.0	3.5	1.2	94.1	1.2	9.0	2.9	.932
173.0-174.0	3.2	1.2	94.5	1.1	8.4	2.9	.927
174.0-175.0	3.2	1.2	94.5	1.1	8.3	2.9	.931
175.0-176.0	3.0	1.5	94.2	1.3	7.6	3.6	.937
176.0-177.0	2.7	1.9	94.0	1.4	7.0	4.6	.937
177.0-178.0	2.3	1.4	95.4	.9	5.9	3.4	.931
178.0-179.0	2.1	1.5	95.6	.8	5.4	3.6	.926
179.0-180.0	2.0	1.4	95.8	.8	5.2a	3.4	.920
180.0-181.0	4.1	1.4	93.1	1.4	10.7	3.4	.927
181.0-182.0	3.0	1.7	94.1	1.2	7.7	4.1	.922
182.0-183.0	4.9	2.1	91.4	1.6	12.8	5.0	.923
183.0-184.0	4.8	1.9	91.8	1.5	12.4	4.6	.929
184.0-185.0	4.4	2.0	92.3	1.3	11.3	4.8	.931
185.0-186.0	3.6	2.1	93.3	1.0	9.1	5.0	.936
186.0-187.0	3.3	2.2	93.6	.9	8.4	5.3	.934
187.0-188.0	3.4	2.2	93.4	1.0	8.8	5.3	.933
188.0-189.0	4.1	1.7	93.1	1.1	10.5	4.1	.923
189.0-190.0	4.9	1.3	92.4	1.4	12.9	3.1	.918
190.0-191.0	3.2	1.5	94.4	.9	8.3	3.6	.918
191.0-192.0	7.0	1.8	89.6	1.6	18.2	4.3	.920
192.0-193.0	6.3	1.5	90.7	1.5	16.3	3.6	.919
193.0-194.0	3.5	1.0	94.4	1.1	9.0	2.4	.917
194.0-195.0	3.5	1.0	94.3	1.2	9.2	2.4	.917
195.0-196.0	2.8	1.0	95.1	1.1	7.5	2.4	.914
196.0-197.0	1.2	.8	97.1	.9	3.1a	1.9	.920
197.0-198.0	1.1	1.0	97.0	.9	2.8a	2.4	.920
198.0-199.0	.7	.9	97.6	.8	1.9a	2.2	.920
199.0-200.0	.4	.8	98.2	.6	1.1a	1.9	.920
200.0-201.0	.4	.9	97.7	1.0	1.1a	2.2	.920
201.0-202.0	.5	1.0	97.5	1.0	1.3a	2.4	.920
202.0-203.0	.8	1.1	97.3	.8	2.2a	2.6	.920
203.0-204.0	1.6	1.4	96.1	.9	4.2a	3.4	.920
204.0-205.0	7.5	1.8	88.7	2.0	19.3	4.3	.927
205.0-206.0	7.3	2.2	88.4	2.1	18.7	5.3	.930
206.0-207.0	3.0	2.4	93.4	1.2	7.8	5.8	.931
207.0-208.0	1.1	1.7	96.4	.8	2.7a	4.1	.920
208.0-209.0	3.9	2.1	92.8	1.2	10.0	5.0	.926
209.0-210.0	3.9	2.3	92.4	1.4	10.1	5.5	.929
210.0-211.0	3.5	2.3	93.0	1.2	8.9	5.5	.931
211.0-212.0	3.5	2.0	93.3	1.2	9.2	4.8	.926
212.0-213.0	3.0	1.7	94.2	1.1	7.7	4.1	.927

Samples from the U.S. Geological Survey's Corehole 78-2 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
213.0-214.0	3.7	1.7	93.3	1.3	9.6	4.1	0.928
214.0-215.0	3.5	1.5	93.7	1.3	9.0	3.6	.925
215.0-216.0	2.9	1.2	95.0	.9	7.4	2.9	.923
216.0-217.0	2.6	1.1	94.9	1.4	6.6	2.6	.925
217.0-218.0	3.0	2.1	94.0	.9	7.6	5.0	.932
218.0-219.0	3.2	2.0	93.9	.9	8.3	4.8	.930
219.0-220.0	6.3	2.2	90.1	1.4	16.2	5.3	.935
220.0-221.0	5.4	2.9	90.4	1.3	13.9	7.0	.937
221.0-222.0	5.9	2.0	90.8	1.3	15.1	4.8	.932
222.0-223.0	5.1	2.2	91.5	1.2	13.1	5.3	.936
223.0-224.0	5.5	2.1	91.1	1.3	14.0	5.0	.938
224.0-225.0	5.3	1.6	91.8	1.3	13.6	3.8	.933
225.0-226.0	4.1	1.5	93.0	1.4	10.6	3.6	.934
226.0-227.0	3.6	1.6	93.8	1.0	9.1	3.8	.940
227.0-228.0	3.5	1.5	94.0	1.0	9.0	3.6	.938
228.0-229.0	3.4	1.1	94.7	.8	8.7	2.6	.935
229.0-230.0	3.0	1.2	95.1	.7	7.6	2.9	.936
230.0-231.0	2.5	2.0	94.8	.7	6.4	4.8	.940
231.0-232.0	2.6	.9	95.8	.7	6.6	2.2	.927
232.0-233.0	2.7	.8	95.8	.7	6.9	1.9	.925
233.0-234.0	2.5	.8	95.8	.9	6.5	1.9	.927
234.0-235.0	2.9	.9	95.3	.9	7.6	2.2	.927
235.0-236.0	3.4	1.4	94.4	.8	8.7	3.4	.931
236.0-237.0	2.5	1.3	95.5	.7	6.5	3.1	.928
237-0-238.0	3.7	1.3	94.0	1.0	9.6	3.1	.923
238.0-239.0	2.4	2.5	94.1	1.0	6.2	6.0	.930
239.0-240.0	4.2	3.8	91.2	.8	10.7	9.1	.942
240.0-241.0	2.6	4.5	92.4	.5	6.5	10.8	.948
241.0-242.0	3.1	2.0	94.0	.9	7.9	4.8	.937
242.0-243.0	4.1	1.8	92.9	1.2	10.6	4.3	.935
243.0-244.0	3.6	1.9	93.5	1.0	9.1	4.6	0.939
244.0-245.0	4.2	1.8	92.9	1.1	10.6	4.3	.943
245.0-246.0	4.1	1.9	93.0	1.0	10.4	4.6	.941
246.0-247.0	3.5	1.7	94.2	.6	9.0	4.1	.936
247.0-248.0	3.1	1.5	94.4	1.0	8.0	3.6	.937
248.0-249.0	4.6	1.2	92.9	1.3	11.9	2.9	.933
249.0-250.0	3.2	1.3	94.6	.9	8.3	3.1	.928
250.0-251.0	3.8	1.9	93.3	1.0	9.8	4.6	.936
251.0-252.0	3.3	1.0	94.8	.9	8.4	2.4	.933
252.0-253.0	3.4	.9	94.7	1.0	8.9	2.2	.927
253.0-254.0	2.7	.9	95.5	.9	7.0	2.2	.928
254.0-255.0	4.1	1.2	93.6	1.1	10.6	2.9	.931
255.0-256.0	3.6	1.3	94.3	.8	9.2	3.1	.934
256.0-257.0	3.9	1.5	93.6	1.0	9.9	3.6	.935
257.0-258.0	3.5	1.7	94.0	.8	9.0	4.1	.933
258.0-259.0	3.7	1.3	93.9	1.1	9.4	3.1	.930
259.0-260.0	4.4	2.5	92.1	1.0	11.4	6.0	.933

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-2 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
260.0-261.0	3.7	1.8	93.5	1.0	9.5	4.3	.934
261.0-262.0	3.4	1.2	94.2	1.2	8.6	2.9	.932
262.0-263.0	3.1	1.2	94.7	1.0	8.1	2.9	.928
263.0-264.0	4.3	1.1	93.0	1.6	11.2	2.6	.929
264.0-265.0	3.9	1.1	93.9	1.1	10.0	2.6	.930
265.0-266.0	3.5	1.2	94.3	1.0	9.0	2.9	.931
266.0-267.0	3.0	1.6	94.6	.8	7.7	3.8	.931
267.0-268.0	1.8	.8	96.7	.7	4.7a	1.9	.920
268.0-269.0	.9	.9	97.7	.5	2.3a	2.2	.920
269.0-270.0	.6	.9	98.0	.5	1.6a	2.2	.920
270.0-271.0	.9	1.2	97.4	.5	2.3a	2.9	.920
271.0-272.0	1.1	1.3	97.0	.6	2.9a	3.1	.920
272.0-273.0	1.2	1.3	96.9	.6	3.1a	3.1	.920
273.0-274.0	2.3	1.9	95.0	0.8	5.9	4.6	0.923
274.0-275.0	3.5	1.6	93.9	1.0	9.1	3.8	.928
275.0-276.0	6.1	1.8	90.4	1.7	15.8	4.3	.924
276.0-277.0	5.3	1.6	91.6	1.5	13.8	3.8	.924
277.0-278.0	3.5	1.2	94.2	1.1	9.1	2.9	.925
278.0-279.0	3.4	1.6	93.8	1.2	8.9	3.8	.929
279.0-280.0	3.5	1.6	93.7	1.2	9.2	3.8	.926
280.0-281.0	3.3	1.8	93.7	1.2	8.6	4.3	.925
281.0-282.0	2.2	1.8	95.9	.9	5.7	4.3	.926
282.0-283.0	4.0	1.7	93.2	1.1	10.3	4.1	.925
283.0-284.0	1.7	2.7	94.8	.8	4.4a	6.5	.920
284.0-285.0	2.5	1.9	94.3	1.3	6.6	4.6	.921
285.0-286.0	4.5	1.9	92.3	1.3	11.7	4.6	.919
286.0-287.0	4.2	2.0	92.5	1.3	10.9	4.8	.923
287.0-288.0	3.4	2.8	92.7	1.1	8.9	6.7	.925
288.0-289.0	1.6	3.8	93.8	.8	4.1a	9.1	.920
289.0-290.0	.8	4.3	94.2	.7	2.1a	10.3	.920
290.0-291.0	.9	4.3	93.9	.9	2.3a	10.3	.920
291.0-292.0	.3	4.4	94.6	.7	.9a	10.5	.920
292.0-293.0	2.2	3.3	93.5	1.0	5.7	7.9	.933
293.0-294.0	.2	3.7	95.7	.4	.5a	8.9	.920
294.0-295.0	1.6	3.1	94.6	.7	4.2a	7.4	.920
295.0-296.0	2.3	3.1	93.7	.9	5.7	7.4	.941
296.0-297.0	2.8	2.3	93.8	1.1	7.2	5.5	.943
297.0-298.0	5.4	1.5	92.0	1.1	13.8	3.6	.938
298.0-299.0	1.7	3.0	94.8	.5	4.4a	7.2	.920
299.0-300.0	3.6	1.2	94.2	1.0	9.1	2.9	.932
300.0-301.0	5.1	1.4	92.3	1.2	13.1	3.4	.928
301.0-302.0	4.8	1.5	92.6	1.1	12.3	3.6	.926
302.0-303.0	3.4	1.8	93.9	.9	8.7	4.3	.935

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-2 (Continued)

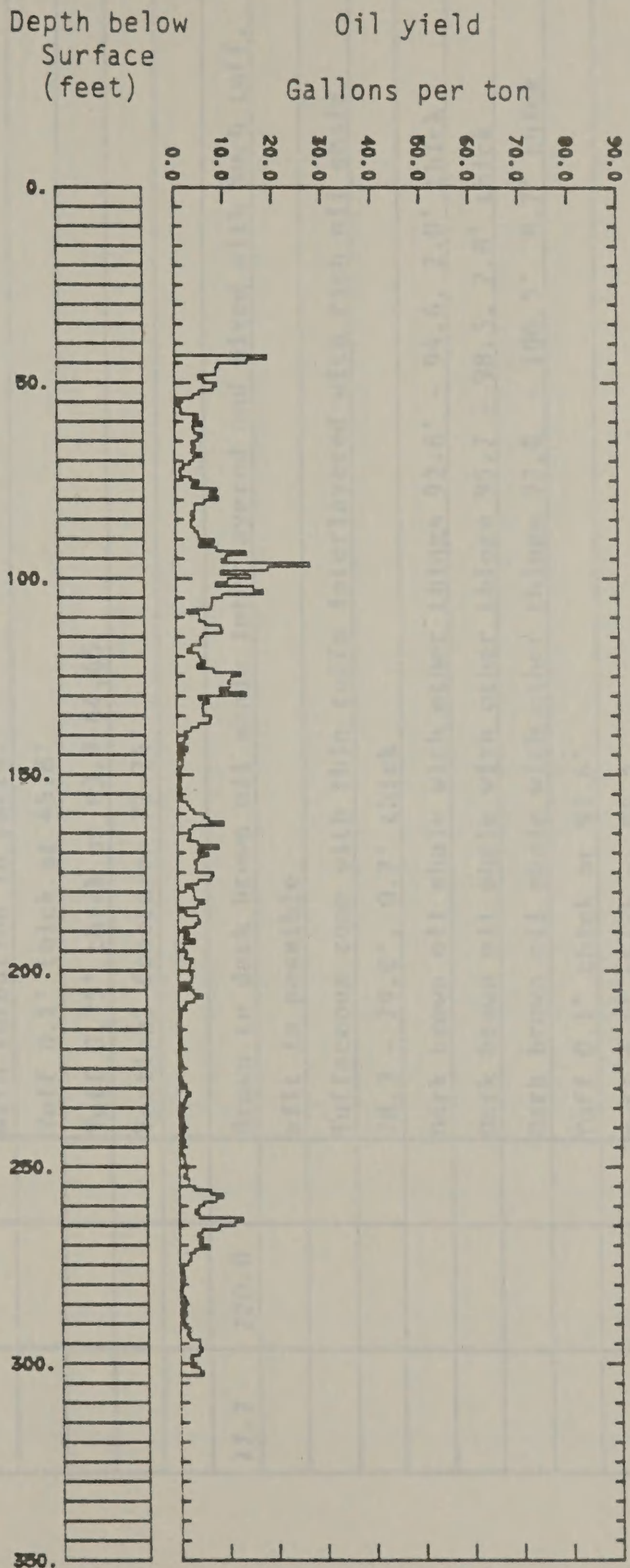
Depth From – To	Yield of product: Weight percent				Yield of product: Gal per ton		Specific gravity of oil at 60°/60° F
	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
303.0-304.0	3.0	1.5	94.8	0.7	7.6	3.6	0.934
304.0-305.0	2.7	1.2	95.5	.6	7.0	2.9	.932
305.0-306.0	2.7	1.2	95.5	.6	7.0	2.9	.927
306.0-306.6	3.9	1.1	94.2	.8	10.1	2.6	.929

1/ "a"--indicates specific gravity estimated as 0.92.

Figure 4.--Map showing location of core holes 78-3 and 78-3A. Base from No Name Ridge Quadrangle (1952). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-3



Corehole 78-3
Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
43.0	77.7		Moderately rich oil shale with much admixed tuff or silt. Color is brown to
			brownish gray. Thin, even bedding
			with turbation in parts.
			Tuff 0.1' thick at 45.8'
			Tuff 0.75' thick at 63.9-64.65
			Vertical fractures 72-74'
77.7	220.0		Brown to dark brown oil shale interlayered and mixed with much tuff. Abundant
			silt is possible
			Tuffaceous zone with thin tuffs interlayered with rich oil shale.
			78.3 - 79.0', 0.7' thick
			Dark brown oil shale with other things 92.6' - 94.6, 2.0' thick
			Dark brown oil shale with other things 95.7 - 98.5, 2.8' thick
			Dark brown oil shale with other things 97.8 - 106.5' 8.7' thick
			Tuff 0.1' thick at 92.6'
			Tuff 0.1' thick at 95.2
			Zone weathered to plastic mud 0.07' thick at 100.6'
			Zone ~50percent massive gray tuff 108.4-109.8; 1.4' thick
			Very dark brown oil shale 109.8-109.9, 0.1' thick
			Dark brown oil shale interlayered with tuff and leaner oil
			Shale 112.3' - 113.9' - 1.6' thick
			Tuff 0.1' thick at 116.1
			Tuff 0.2' thick at 118.6 - 118.8'
			Tuff 0.2' thick at 126.2 - 126.4

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.2' thick at 128.2- 128.4
			Tuff 0.1' thick at 129.9
			Tuff 0.2' thick at 130.3- 130.5
			Tuff 0.15' thick at 130.7-130.85
			Fractures: 128' - 130'
			134.5 - 140' highly fractured
			Tuff 0.15' thick at 144.9 - 145.05
			Tuff 0.25' thick at 147.0 - 147.25
			Tuff 0.3' thick at 155.3 - 155.6 with some oil shale
			Tuff 0.1' thick at 156.4
			Tuff 0.5' thick at 157.6-158.1 turbated with oil shale
			Tuff 0.1' thick at 163.2'
			Tuff 0.1' thick at 164.7'
			Tan tuff 0.5' thick at 169.3-169.8 with some oil shale
			Dark brown rich oil shale interbedded with leaner oil shale and tuff 160.3-162.8,
			2.5' thick
			168.6-170.5, 1.9' thick
			Tuff 0.1' thick at 174.4
			Tuff 0.3' thick at 176.7- 177'
			Tuff 0.15' thick at 177.4 - 177.55
			Tuff 0.1' thick at 177.7 - 177.8
			Tuff 0.1' thick at 178.2'
			Tuff 0.2' thick at 186.5-186.7 with mixed oil shale
			Tuff 0.3' thick at 187.0-187.3 with mixed oil shale

Corehole 78-3 (Continued)

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			Dark brown rich oil shale with tuff 186.8 - 187.6, 0.8'
			Tuff 2.25' thick at 187.6-189.85 with minor mixed shale
			Tuff 0.1' thick at 189.9
			~60 percent massive tuff zone 190.1-191.3, 1.2' thick with 40 percent dark
			brown oil shale
			Tuff 0.15' thick at 191.85'-192.0
			Tuff 0.15' thick at 192.2-192.35'
			Tuff 0.2' thick at 193.5 - 193.7'
			Tuff 0.15' thick at 197.8-197.95
			Tuff 0.25' thick at 199.85-200.1' with minor shale
			Tuff 0.15' thick at 203.15 - 203.3'
			204.0-205.5' highly fractured
			Tuff 0.15' thick at 205.6-205.75'
			Tuff 0.1' thick at 206.2
			Tuff 0.1' thick at 206.7
			Tuff 0.18' thick at 210.0'210.18'
			Tuff 0.2' thick at 210.9-211.1
			Tuff 0.1' thick at 215.3'
			Tuff 0.1' thick at 215.5'
			Tuff 0.45' thick at 216.6-217.05 with mixed shale
			Tuff 0.4' thick at 218.0-218.4 with mixed shale
			Tuff 0.1' thick at 218.9'
			Tuff 0.2' thick at 220.0' - 220.2'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
220.0	255.5		Gray to brown oil shale mixed and bedded with much silt or/and tuff. Oil Shale
			is lean to moderate. Generally evenly bedded with little turbation
			Tuff 0.2' thick at 234.2'-234.4'
			Tuff 1.0' thick at 235.2-236.2'
			Tuff 0.1' thick at 238.3
			Tuff 0.1' thick at 240.9'
			Tuff 0.15' thick at 242.05-242
			Tuff 0.15' thick at 245.1-245.25
			Tuff 0.2' thick at 245.4-245.6'
			Tuff 0.3' thick at 252.6-252.9 with some shale
			Tuff 0.15' thick at 254.5'
255.5	273.4		Gray brown to brown oil shale moderately lean with less silt than above unit.
			Shale is somewhat fissile.
			Some parts brown to dark brown oil shale with interlayered tuff.
			Dark brown oil shale with abundant thin tuff layers near base, 256.7-258.4
			Tuff 0.1' thick at 264.3'
273.4	302.9		Similar to interval 220.0 - 255.5'
			Tuff 0.1' thick at 276.5'
			Tuff 0.1' thick at 289.6'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.1' thick at 291.5'
			Tuff 0.1' thick at 292.1'
			Tuff 0.1' thick at 292.5'
			Tuff 0.15' thick at 292.7-292.9'
			Tuff 0.1' thick at 300.1'

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3 drilled in sec. 14, T. 2 S., R 95 W, Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
43.0	44.0	7.1	3.0	88.0	1.9	18.9	7.2	0.897
44.0	45.0	5.6	3.1	89.8	1.5	14.8	7.4	.908
45.0	46.0	3.4	3.1	92.3	1.2	8.8	7.4	.916
46.0	47.0	3.2	2.6	93.2	1.0	8.4	6.2	.911
47.0	48.0	3.2	2.2	93.4	1.2	8.4	5.3	.914
48.0	49.0	1.9	2.0	95.3	.8	4.8a	4.8	
49.0	50.0	2.3	1.8	95.1	.8	5.9	4.3	.916
50.0	51.0	3.3	1.7	93.6	1.4	8.6	4.1	.914
51.0	52.0	3.0	2.3	93.6	1.1	7.8	5.5	.913
52.0	53.0	1.9	1.9	95.2	1.0	5.0a	4.6	
53.0	54.0	1.4	1.8	96.0	.8	3.7a	4.3	
54.0	55.0	.2	1.6	97.7	.5	.5a	3.8	
55.0	56.0	.3	1.4	97.7	.6	.8a	3.4	
56.0	57.0	.5	1.6	97.4	.5	1.2a	3.8	
57.0	58.0	.5	1.6	96.7	1.2	1.3a	3.8	
58.0	59.0	1.8	2.6	94.8	.8	4.8a	6.2	
59.0	60.0	1.4	2.3	95.6	.7	3.7a	5.5	
60.0	61.0	2.1	2.3	93.8	1.8	5.6	5.5	.916
61.0	62.0	1.4	1.9	96.0	.7	3.6a	4.6	
62.0	63.0	1.5	2.3	95.5	.7	4.0a	5.5	
63.0	64.0	2.1	3.0	94.1	.8	5.5	7.2	.919
64.0	65.0	1.8	4.6	92.5	1.1	4.8a	11.0	
65.0	66.0	1.3	1.8	96.1	.8	3.4a	4.3	
66.0	67.0	1.6	1.7	96.0	.7	4.1a	4.1	
67.0	68.0	1.3	1.9	96.1	.7	3.3a	4.6	
68.0	69.0	2.1	1.9	95.2	.8	5.4	4.6	.912
69.0	70.0	1.4	1.3	96.3	1.0	3.7a	3.1	
70.0	71.0	1.2	1.4	96.8	.6	3.0a	3.4	
71.0	72.0	.7	1.2	97.6	.5	1.7a	2.9	
72.0	73.0	.4	1.3	97.9	.4	1.0a	3.1	
73.0	74.0	0.4	1.3	97.8	0.5	1.1a	3.1	
74.0	75.0	1.2	1.6	96.5	.7	3.2a	3.8	
75.0	76.0	1.8	1.9	95.2	1.1	4.8a	4.6	
76.0	77.0	1.3	2.0	96.0	.7	3.4a	4.8	
77.0	78.0	3.3	2.2	93.4	1.1	8.5	5.3	0.920
78.0	79.0	2.7	2.0	93.6	1.7	7.0	4.8	.920
79.0	80.0	3.3	2.2	93.4	1.1	8.8	5.3	.908
80.0	81.0	2.2	1.8	94.8	1.2	5.9	4.3	.904
81.0	82.0	1.5	1.7	95.9	.9	3.9a	4.1	
82.0	83.0	1.5	1.7	96.5	.3	3.9a	4.1	
83.0	84.0	1.2	2.1	96.2	.5	3.1a	5.0	
84.0	85.0	1.5	2.0	96.1	.4	3.9a	4.8	
85.0	86.0	1.2	2.4	96.0	.4	3.2a	5.8	
86.0	87.0	1.2	1.9	96.1	.8	3.1a	4.6	
87.0	88.0	1.5	2.0	96.1	.4	3.9a	4.8	
88.0	89.0	1.8	2.1	95.7	.4	4.6a	5.0	
89.0	90.0	1.8	2.1	95.7	.4	4.8a	5.0	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
90.0-91.0		3.0	2.2	93.7	1.1	7.9	5.3	.909
91.0-92.0		1.8	1.8	95.2	1.2	4.8a	4.3	
92.0-93.0		3.2	2.4	93.3	1.1	8.4	5.8	.913
93.0-94.0		5.6	2.6	90.4	1.4	14.4	6.2	.926
94.0-95.0		3.9	2.0	92.9	1.2	10.3	4.8	.919
95.0-96.0		3.6	2.0	93.3	1.1	9.4	4.8	.915
96.0-97.0		10.4	2.4	84.9	2.3	27.4	5.8	.910
97.0-98.0		7.1	2.5	88.7	1.7	18.8	6.0	.904
98.0-99.0		3.5	2.2	92.8	1.5	9.2	5.3	.920
99.0-100.0		5.8	1.9	90.8	1.5	15.3	4.6	.915
100.0-101.0		4.0	2.1	92.7	1.2	10.5	5.0	.917
101.0-102.0		3.1	1.2	94.1	1.6	8.2	2.9	.917
102.0-103.0		6.1	1.8	90.6	1.5	15.9	4.3	.914
103.0-104.0		6.7	2.8	88.8	1.7	17.8	6.7	0.902
104.0-105.0		3.6	2.5	92.8	1.1	9.4	6.0	.908
105.0-106.0		2.7	2.2	94.0	1.1	7.3	5.3	.898
106.0-107.0		2.8	1.9	94.3	1.0	7.3	4.6	.911
107.0-108.0		2.7	2.1	94.1	1.1	7.1	5.0	.908
108.0-109.0		.8	1.9	96.7	.6	2.2a	4.6	
109.0-110.0		1.8	2.2	95.2	.8	4.7a	5.3	
110.0-111.0		1.8	1.7	95.2	1.3	4.7a	4.1	
111.0-112.0		2.3	2.2	94.7	.8	6.0	5.3	.912
112.0-113.0		3.5	2.3	93.2	1.0	9.1	5.5	.915
113.0-114.0		3.6	2.4	92.9	1.1	9.4	5.8	.927
114.0-115.0		2.1	1.5	95.8	.6	5.4	3.6	.918
115.0-116.0		1.8	1.9	95.6	.7	4.8a	4.6	
116.0-117.0		1.9	2.1	94.9	1.1	4.9a	5.0	
117.0-118.0		1.2	1.7	96.1	1.0	3.1a	4.1	
118.0-119.0		.8	1.7	96.7	.8	2.2a	4.1	
119.0-120.0		1.7	1.4	95.1	1.8	4.5a	3.4	
120.0-121.0		1.9	2.3	94.8	1.0	4.9a	5.5	
121.0-122.0		2.2	2.1	94.5	1.2	5.8	5.0	.912
122.0-123.0		1.6	2.1	94.9	1.4	4.2a	5.0	
123.0-124.0		2.9	1.8	94.0	1.3	7.6	4.3	.906
124.0-125.0		4.9	2.0	91.9	1.2	13.1	4.8	.902
125.0-126.0		4.2	2.0	92.5	1.3	11.1	4.8	.905
126.0-127.0		3.9	1.8	93.2	1.1	10.5	4.3	.898
127.0-128.0		4.0	1.3	93.6	1.1	10.9	3.1	.892
128.0-129.0		3.3	1.3	94.3	1.1	8.7	3.1	.906
129.0-130.0		5.3	1.7	91.4	1.6	14.2	4.1	.902
130.0-131.0		1.7	1.5	95.8	1.0	4.4a	3.6	
131.0-132.0		2.5	1.5	95.0	1.0	6.6	3.6	.911
132.0-133.0		2.0	1.5	95.5	1.0	5.2	3.6	.918

Samples from the U.S. Geological Survey's Corehole 78-3 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
133.0-134.0	2.0	1.5	95.7	0.8	5.3	3.6	0.921
134.0-135.0	2.1	1.5	95.4	1.0	5.4	3.6	.922
135.0-136.0	2.7	1.5	94.8	1.0	7.0	3.6	.920
136.0-137.0	2.6	1.5	94.8	1.1	6.7	3.6	.916
137.0-138.0	1.6	1.1	96.4	.9	4.3a	2.6	
138.0-139.0	1.1	1.2	97.0	.7	2.8a	2.9	
139.0-140.0	.6	.9	97.4	1.1	1.5a	2.2	
140.0-141.0	.8	1.0	97.4	.8	2.1a	2.4	
141.0-142.0	.5	1.2	97.7	.6	1.4a	2.9	
142.0-143.0	.3	1.5	97.8	.4	.7a	3.6	
143.0-144.0	.8	1.0	97.7	.5	2.1a	2.4	
144.0-145.0	.1	1.4	98.0	.5	.4a	3.4	
145.0-146.0	.2	1.0	97.9	.9	.5a	2.4	
146.0-147.0	.4	1.2	97.8	.6	1.1a	2.9	
147.0-148.0	.4	1.2	97.8	.6	1.1a	2.9	
148.0-149.0	.3	1.1	97.4	1.2	.7a	2.6	
149.0-150.0	.2	1.5	97.9	.4	.5a	3.6	
150.0-151.0	.2	1.6	97.7	.5	.5a	3.8	
151.0-152.0	.3	1.5	97.8	.4	.7a	3.6	
152.0-153.0	.2	1.4	97.9	.5	.5a	3.4	
153.0-154.0	.3	1.4	97.8	.5	.8a	3.4	
154.0-155.0	.2	1.5	97.7	.6	.6a	3.6	
155.0-156.0	.1	1.5	97.9	.5	.3a	3.6	
156.0-157.0	.3	1.6	97.5	.6	.9a	3.8	
157.0-158.0	.8	1.8	96.4	1.0	2.0a	4.3	
158.0-159.0	.9	1.7	96.7	.7	2.5a	4.1	
159.0-160.0	1.3	1.8	96.1	.8	3.3a	4.3	
160.0-161.0	2.1	1.9	95.0	1.0	5.5	4.6	.905
161.0-162.0	2.4	2.4	94.1	1.1	6.4	5.8	.911
162.0-163.0	3.5	2.1	93.1	1.3	9.4	5.0	.901
163.0-164.0	1.1	1.6	96.3	1.0	2.9a	3.8	
164.0-165.0	.8	2.1	96.1	1.0	2.2a	5.0	
165.0-166.0	1.0	2.2	96.1	.7	2.6a	5.3	
166.0-167.0	.7	1.6	96.3	1.4	1.9a	3.8	
167.0-168.0	1.6	1.8	95.8	.8	4.1a	4.3	
168.0-169.0	3.2	1.8	93.9	1.1	8.4	4.3	0.917
169.0-170.0	1.6	1.0	96.4	1.0	4.1a	2.4	
170.0-171.0	2.4	1.7	94.2	1.7	6.3	4.1	.920
171.0-172.0	1.6	2.0	95.5	.9	4.2a	4.8	
172.0-173.0	1.3	1.9	95.8	1.0	3.4a	4.6	
173.0-174.0	1.5	2.2	95.5	.8	3.9a	5.3	
174.0-175.0	1.4	2.0	95.7	.9	3.6a	4.8	
175.0-176.0	2.8	2.1	93.9	1.2	7.3	5.0	.913
176.0-177.0	2.6	1.6	95.0	.8	6.8	3.8	.918
177.0-178.0	1.6	1.3	96.3	.8	4.1a	3.1	
178.0-179.0	.6	1.3	97.5	.6	1.5a	3.1	
179.0-180.0	1.2	1.2	96.9	.7	3.1a	2.9	
180.0-181.0	1.2	1.2	96.8	.8	3.3a	2.9	
181.0-182.0	1.3	1.6	96.3	.9	3.4a	3.6	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
182.0-183.0	2.1	1.5	95.6	.8	5.4	3.6	.910
183.0-184.0	1.5	1.4	96.4	.7	4.0a	3.4	
184.0-185.0	.1	4.0	95.5	.4	.3a	9.6	
185.0-186.0	.6	4.1	94.9	.4	1.6a	9.8	
186.0-187.0	1.6	2.5	94.5	1.4	4.1a	6.0	
187.0-188.0	1.7	1.5	96.0	.8	4.5a	3.6	
188.0-189.0	1.3	1.4	96.7	.6	3.5a	3.4	
189.0-190.0	.4	1.5	97.4	.7	1.1a	3.6	
190.0-191.0	.8	1.7	97.0	.5	2.2a	4.1	
191.0-192.0	.4	1.8	97.2	.6	1.2a	4.3	
192.0-193.0	1.3	1.5	96.6	.6	3.3a	3.6	
193.0-194.0	0.4	1.2	97.7	0.7	1.0a	2.9	
194.0-195.0	.4	1.6	97.6	.4	1.1a	3.8	
195.0-196.0	.7	1.5	97.2	.6	1.8a	3.6	
196.0-197.0	.5	1.0	97.3	1.2	1.4a	2.4	
197.0-198.0	1.1	1.4	97.0	.5	2.9a	3.4	
198.0-199.0	.9	1.5	97.1	.5	2.3a	3.6	
199.0-200.0	.8	1.5	97.1	.6	2.1a	3.6	
200.0-201.0	.9	1.3	97.4	.4	2.3a	3.1	
201.0-202.0	1.1	1.7	96.5	.7	2.9a	4.1	
202.0-203.0	1.0	1.7	96.9	.4	2.6a	4.1	
203.0-204.0	.3	1.6	97.6	.5	.8a	3.8	
204.0-205.0	1.0	1.9	96.7	.4	2.5a	4.6	
205.0-206.0	1.2	1.8	96.1	.9	3.1a	4.3	
206.0-207.0	1.9	2.5	94.5	1.1	4.9a	6.0	
207.0-208.0	1.2	3.0	95.1	.7	3.1a	7.2	
208.0-209.0	.6	3.0	95.6	.8	1.5a	7.2	
209.0-210.0	.4	2.8	96.3	.5	1.1a	6.7	
210.0-211.0	.1	2.7	96.6	.6	.4a	6.5	
211.0-212.0	.2	2.8	96.3	.7	.5a	6.7	
212.0-213.0	.2	2.7	96.7	.4	.4a	6.5	
213.0-214.0	.1	2.3	97.2	.4	.4a	5.5	
214.0-215.0	.0	1.2	97.8	1.0	Trace	3.0	
215.0-216.0	.2	2.7	96.7	.4	.5a	6.5	
216.0-217.0	.1	1.7	97.8	.4	.2a	4.1	
217.0-218.0	.2	1.5	97.6	.7	.5a	3.6	
218.0-219.0	.1	1.1	98.0	.8	.4a	2.6	
219.0-220.0	.2	1.9	97.3	.6	.6a	4.6	
220.0-221.0	.0	1.5	98.0	.5	Trace	3.6	
221.0-222.0	.1	1.9	97.6	.4	.3a	4.6	
222.0-223.0	.1	1.8	97.8	.3	.3a	4.3	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3 (Continued)

Depth From – To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
223.0-224.0	0.2	1.6	97.8	0.4	0.6a	3.8	
224.0-225.0	.3	1.4	97.8	.5	.8a	3.4	
225.0-226.0	.2	1.0	98.2	.6	.5a	2.4	
226.0-227.0	.1	1.0	98.4	.5	.3a	2.4	
227.0-228.0	.2	.8	98.5	.5	.5a	1.9	
228.0-229.0	.3	1.3	97.9	.5	.7a	3.1	
229.0-230.0	.5	1.8	96.9	.8	1.4a	4.3	
230.0-231.0	.6	1.0	97.9	.5	1.5a	2.4	
231.0-232.0	.9	1.0	97.6	.5	2.2a	2.4	
232.0-233.0	.5	.9	98.0	.6	1.4a	2.2	
233.0-234.0	.4	.9	98.2	.5	1.1a	2.2	
234.0-235.0	.1	.5	98.6	.8	.2a	1.2	
235.0-236.0	.3	.9	98.3	.5	.9a	2.2	
236.0-237.0	.2	.9	98.3	.6	.6a	2.2	
237.0-238.0	.3	1.0	98.3	.4	.8a	2.4	
238.0-239.0	.3	.9	98.3	.5	.9a	2.2	
239.0-240.0	.4	1.0	98.3	.3	1.0a	2.4	
240.0-241.0	.4	1.1	98.0	.5	1.1a	2.6	
241.0-242.0	.3	.9	98.0	.8	.8a	2.2	
242.0-243.0	.3	1.2	98.1	.4	.7a	2.9	
243.0-244.0	.4	1.2	98.0	.4	1.1a	2.9	
244.0-245.0	.2	.9	97.8	1.1	.5a	2.2	
245.0-246.0	.2	1.3	98.1	.4	.4a	3.1	
246.0-247.0	.2	1.3	98.1	.4	.5a	3.1	
247.0-248.0	.4	1.3	97.9	.4	1.0a	3.1	
248.0-249.0	.4	1.4	97.7	.5	1.1a	3.4	
249.0-250.0	.5	1.3	97.8	.4	1.2a	3.1	
250.0-251.0	.5	1.5	97.6	.4	1.4a	3.6	
251.0-252.0	.6	1.3	97.7	.4	1.5a	3.1	
252.0-253.0	.4	1.2	98.0	.4	1.0a	2.9	
253.0-254.0	0.7	1.1	97.3	0.9	1.9a	2.6	
254.0-255.0	.7	1.3	97.2	.8	1.9a	3.1	
255.0-256.0	1.2	1.4	96.6	.8	3.1a	3.4	
256.0-257.0	2.5	1.6	94.8	1.1	6.4	3.8	0.917
257.0-258.0	3.4	2.5	93.0	1.1	8.9	6.0	.923
258.0-259.0	2.9	2.1	93.8	1.2	7.5	5.0	.913
259.0-260.0	1.9	2.2	94.6	1.3	4.9a	5.3	
260.0-261.0	1.5	1.6	96.0	.9	3.9a	3.8	
261.0-262.0	1.2	1.4	96.7	.7	3.2a	3.4	
262.0-263.0	1.5	1.1	95.7	1.7	4.0a	2.6	
263.0-264.0	4.9	1.9	91.7	1.5	13.0	4.6	.908
264.0-265.0	4.3	1.5	92.9	1.3	11.3	3.6	.905
265.0-266.0	3.0	1.5	94.1	1.4	8.1	3.6	.905
266.0-267.0	1.8	1.5	95.4	1.3	4.6a	3.6	
267.0-268.0	1.4	1.3	96.5	.8	3.6a	3.1	
268.0-269.0	1.8	1.2	95.9	1.1	4.7a	2.9	
269.0-270.0	1.5	2.0	95.7	.8	3.9a	4.8	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

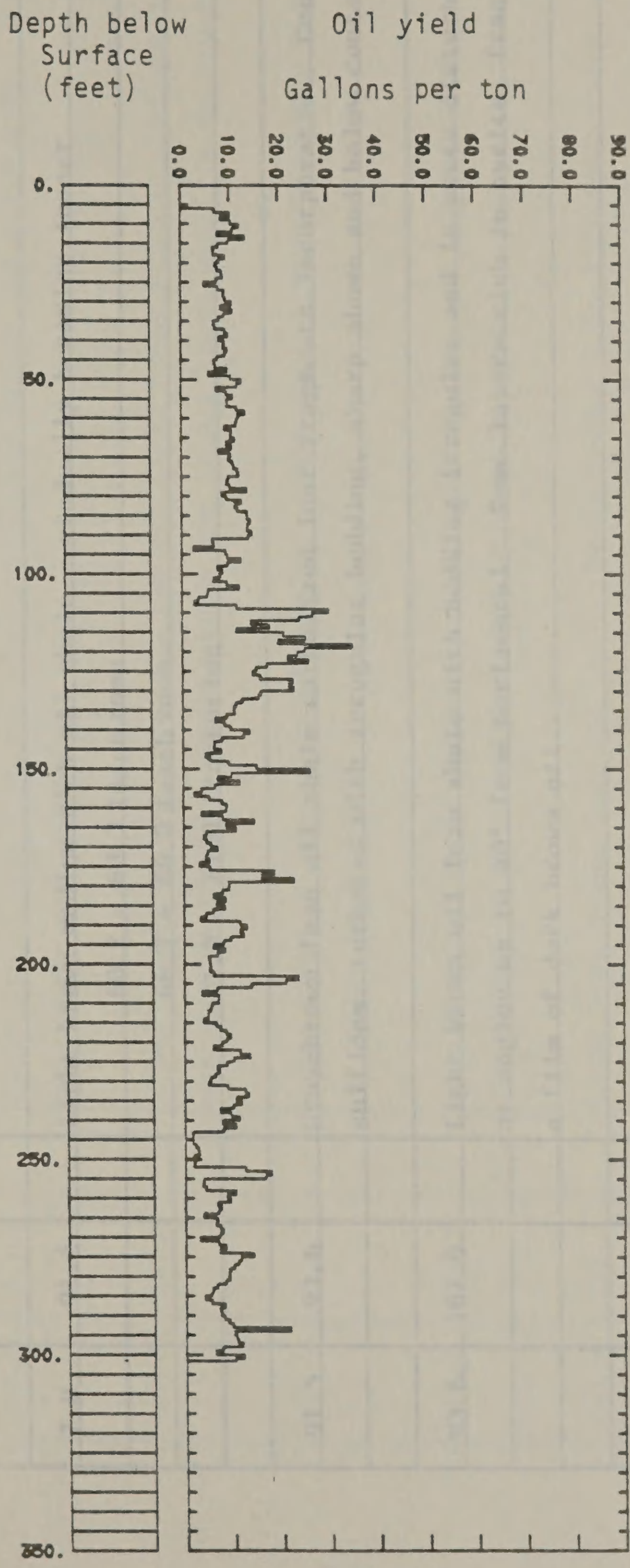
Samples from the U.S. Geological Survey's Corehole 78-3 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil 1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
270.0-271.0	2.3	2.1	94.6	1.0	6.0	5.0	.908
271.0-272.0	1.1	1.3	96.8	.8	3.0a	3.1	
272.0-273.0	.8	1.0	97.8	.4	2.0a	2.4	
273.0-274.0	.8	1.0	97.4	.8	2.2a	2.4	
274.0-275.0	.6	1.0	98.0	.4	1.6a	2.4	
275.0-276.0	.2	1.1	98.3	.4	.5a	2.6	
276.0-277.0	.3	2.2	97.1	.4	.7a	5.3	
277.0-278.0	.3	1.1	98.1	.5	.8a	2.6	
278.0-279.0	.3	1.1	98.2	.4	.9a	2.6	
279.0-280.0	.2	1.3	98.1	.4	.6a	3.1	
280.0-281.0	.2	1.3	98.0	.5	.5a	3.1	
281.0-282.0	.2	1.2	98.2	.4	.4a	2.9	
282.0-283.0	.1	.9	98.3	.7	.3a	2.2	
283.0-284.0	0.4	1.3	97.8	0.5	1.0a	3.1	
284.0-285.0	.5	1.2	97.5	.8	1.4a	2.9	
285.0-286.0	.4	1.2	97.8	.6	1.1a	2.9	
286.0-287.0	.1	1.4	97.9	.6	.3a	3.4	
287.0-288.0	.5	1.4	97.4	.7	1.3a	3.4	
288.0-289.0	.3	1.5	97.6	.6	.7a	3.6	
289.0-290.0	.3	1.0	97.8	.9	.8a	2.4	
290.0-291.0	.4	1.4	97.7	.5	1.0a	3.4	
291.0-292.0	.8	1.3	97.2	.7	2.1a	3.1	
292.0-293.0	.5	1.0	97.6	.9	1.4a	2.4	
293.0-294.0	.8	1.2	97.4	.6	2.0a	2.9	
294.0-295.0	1.5	1.5	96.1	.9	4.0a	3.6	
295.0-296.0	1.4	1.5	96.3	.8	3.8a	3.6	
296.0-297.0	1.7	1.3	96.2	.8	4.4a	3.1	
297.0-298.0	1.4	1.4	96.3	.9	3.8a	3.4	
298.0-299.0	.8	1.4	97.2	.6	2.0a	3.4	
299.0-300.0	1.0	1.4	96.9	.7	2.5a	3.4	
300.0-301.0	.8	1.2	97.3	.7	2.0a	2.9	
301.0-302.0	1.5	1.4	95.9	1.2	3.9a	3.4	
302.0-303.0	1.7	1.5	96.0	.8	4.6a	3.6	

1/ "a"--indicates specific gravity estimated as 0.92.

U.S. Geological Survey

Core hole 78-3A



Logged by Kurt Hollocher

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
6.0	6.8		Gray-brown medium rich oil shale
6.8	7.0		Brown clay
7.0	91.5		Light brown medium rich oil shale - gradually becoming leaner
			60.2 - 60.3 leach zone
			66.7 - 66.8 leach zone
			71.0 - 75.0 fracturing
91.5	93.6		Gray-brown lean oil shale carbonized leaf fragments incorporated. Contains iron sulfides, turbated with irregular bedding, sharp above and below contacts.
93.6	107.9		Light brown oil lean shale with bedding irregular and in parts disturbed, commonly at angles up to 40° from horizontal. Some layers rich in pyrite, fractures have a film of dark brown oil.
107.9	131.3		Interbedded light gray (silty?) to brown oil shale, brown layers are lean. Bedding and contacts are irregular with common recumbant isoclinal folding less turbated toward bottom.
131.3	139.0		light brown lean oil shale, evenly and thinly bedded in most parts, some with contortion of layers. Darker brown layers rare and thin

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
139.0	140.1		Brown lean oil shale alternating with light brown and silty (?) layers thinly and evenly bedded, undisturbed.
140.1	147.8		Light gray brown lean oil shale with thin darker and silty beds. Bedding relatively undisturbed.
147.8	149.8		Brown layers alternating with tan and light brown layers. Bedding is uneven and somewhat disturbed. Brown layers are lean without oil film in fracture.
149.8	173.7		Light brown to gray lean oil shale, thinly to irregularly bedded beds dipping at angles up to ~20°.
173.7	180.6		Brown lean oil shale interbedded with white, tan, and tannish pink layers. Beds are irregular and disturbed with folding in parts.
180.6	299.7		Light gray brown lean oil shale thinly bedded with disturbed areas. Some light gray layers, some with pyrite, silty or dolomitic beds common. Darker brown ========== between 201.2 and 202.1. Tuff lean, thick at 201.35. Tuff 0.2' thick at 218.2'. 220.3' to 221.5' beds of darker brown oil shale interbedded with lighter brown and tan shale beds. Tuff(?) 0.09' thick at 220.3'. Oil oozing from fractures from 227.9' - 229.0 in lean shale. Tuff 0.2' thick at 234.1', tuff 0.2' thick 236.1'. Interbedded dark brown lean oil shale, gray to tan oil shale, and tuff with silty and/or dolomitic beds from 238.5' to 239'. Brown lean oil shale interbedded with lighter shale from 250.4' to 253.0 darker than rest of core.
BOTTOM OF HOLE			

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			0.4' soft brown siltstone at 264.1-264.5, oil free. 0.3' grayish brown siltstone at 0.7' dark brown to cream colored siltstone with minor lean oil shale, contorted in upper part with solution pits of salts. Gray siltstones with included chips of lean oil shale 0.3' at 280.1- 280.4.; 0.1' at 281.0-281.1; 0.4' at 281.5-281.9' 0.8' at 283.6 - 284.4. Gray siltstone interbedded and turbated with brown lean oil shale from 292.0-294.4'.

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3A drilled in sec. 26, T. 2 S., R. 95 W., Rio Blanco County, Colorado

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
6.0-7.0	2.7	2.0	93.8	1.5	7.0	4.8	0.939
7.0-8.0	4.0	2.0	92.9	1.1	10.2	4.8	.945
8.0-9.0	3.3	2.0	93.5	1.2	8.3	4.8	.945
9.0-10.0	4.1	1.8	93.0	1.1	10.3	4.3	.946
10.0-11.0	4.7	1.5	92.4	1.4	12.0	3.6	.948
11.0-12.0	4.2	1.2	93.4	1.2	10.7	2.9	.938
12.0-13.0	2.9	2.2	93.6	1.3	7.6	5.3	.925
13.0-14.0	5.1	1.7	91.8	1.4	13.2	4.1	.927
14.0-15.0	3.8	1.3	93.5	1.4	9.8	3.1	.934
15.0-16.0	3.0	1.1	95.2	.7	7.7	2.6	.934
16.0-17.0	2.6	.8	96.1	.5	6.6	1.9	.936
17.0-18.0	2.7	.9	95.9	.5	6.8	2.2	.935
18.0-19.0	3.6	2.1	93.2	1.1	9.1	5.0	.940
19.0-20.0	3.1	1.8	94.2	.9	7.8	4.3	.948
20.0-21.0	2.8	1.4	95.2	.6	7.1	3.4	.943
21.0-22.0	3.0	1.6	94.8	.6	7.5	3.8	.942
22.0-23.0	3.3	1.5	94.2	1.0	8.4	3.6	.946
23.0-24.0	3.4	1.4	94.3	.9	8.6	3.4	.946
24.0-25.0	2.9	1.8	94.5	.8	7.3	4.3	.947
25.0-26.0	1.8	1.4	96.1	.7	4.8a	3.4	.920
26.0-27.0	3.0	1.2	94.9	.9	7.6	2.9	.945
27.0-28.0	3.5	1.3	94.3	.9	8.9	3.1	.946
28.0-29.0	3.5	1.6	93.9	1.0	8.8	3.8	.946
29.0-30.0	3.6	1.6	93.8	1.0	9.2	3.8	.943
30.0-31.0	4.1	1.5	93.3	1.1	10.4	3.6	.942
31.0-32.0	3.2	1.2	94.6	1.0	8.2	2.9	.944
32.0-33.0	4.2	1.3	93.4	1.1	10.6	3.1	.943
33.0-34.0	3.5	1.8	93.5	1.2	8.8	4.3	.945
34.0-35.0	3.0	1.2	95.1	.7	7.7	2.9	.943
35.0-36.0	2.6	1.1	95.5	.8	6.7	2.6	.940
36.0-37.0	2.7	1.1	95.6	0.6	6.9	2.6	.939
37.0-38.0	3.6	1.5	93.7	1.2	9.1	3.6	.943
38.0-39.0	3.8	1.6	93.5	1.1	9.6	3.8	.942
39.0-40.0	3.1	1.5	94.6	.8	7.8	3.6	.943
40.0-41.0	3.5	1.4	94.2	.9	8.9	3.4	.942
41.0-42.0	3.4	1.4	94.2	1.0	8.7	3.4	.941
42.0-43.0	3.7	1.2	94.2	.9	9.5	2.9	.944
43.0-44.0	3.5	1.5	94.2	.8	9.0	3.6	.940
44.0-45.0	2.9	1.5	94.9	.7	7.4	3.6	.937
45.0-46.0	2.6	1.4	95.2	.8	6.7	3.4	.940
46.0-47.0	2.8	1.9	94.4	.9	7.0	4.6	.939
47.0-48.0	3.7	1.6	93.7	1.0	9.5	3.8	.942
48.0-49.0	2.2	1.4	95.6	.8	5.7	3.4	.941
49.0-50.0	4.0	1.7	92.9	1.4	10.2	4.1	.939

Samples from the U.S. Geological Survey's Corehole 78-3A (Continued)

Depth From To	Yield of product: Weight percent Oil	Water	Spent shale	Gas + loss	Gal per ton Oil 1/	Water	Specific gravity of oil at 60°/60° F
50.0-51.0	4.9	1.6	92.2	1.3	12.4	3.8	.941
51.0-52.0	4.4	1.8	92.6	1.2	11.4	4.3	.937
52.0-53.0	2.8	1.5	94.8	.9	7.2	3.6	.927
53.0-54.0	3.6	1.8	93.5	1.1	9.3	4.3	.920
54.0-55.0	4.1	1.7	93.0	1.2	10.6	4.1	.924
55.0-56.0	3.6	1.9	93.5	1.0	9.4	4.6	.919
56.0-57.0	3.6	1.8	93.6	1.0	9.4	4.3	.920
57.0-58.0	4.4	2.2	91.9	1.5	11.4	5.3	.919
58.0-59.0	5.0	1.8	91.8	1.4	13.1	4.3	.914
59.0-60.0	4.5	2.2	92.0	1.3	11.7	5.3	.914
60.0-61.0	4.3	2.1	92.2	1.4	11.4	5.0	.917
61.0-62.0	4.3	2.0	92.3	1.4	11.2	4.8	.920
62.0-63.0	3.4	1.5	94.2	.9	8.9	3.6	.917
63.0-64.0	4.0	1.4	93.4	1.2	10.3	3.4	.916
64.0-65.0	3.9	1.3	93.7	1.1	10.1	3.1	.916
65.0-66.0	4.2	1.5	93.2	1.1	10.9	3.6	.917
66.0-67.0	3.6	2.5	92.7	1.2	9.2	6.0	.924
67.0-68.0	4.0	2.1	92.2	1.7	10.3	5.0	.920
68.0-69.0	3.0	1.6	94.4	1.0	7.7	3.8	.923
69.0-70.0	3.9	1.9	92.9	1.3	10.1	4.6	.932
70.0-71.0	3.7	2.0	93.3	1.0	9.7	4.8	.928
71.0-72.0	4.1	1.8	93.0	1.1	10.5	4.3	.927
72.0-73.0	4.2	2.0	92.5	1.3	10.8	4.8	.927
73.0-74.0	4.5	1.9	92.3	1.3	11.5	4.6	.930
74.0-75.0	4.6	1.8	92.3	1.3	11.8	4.3	.927
75.0-76.0	3.7	2.2	93.0	1.1	9.6	5.3	.930
76.0-77.0	3.6	2.0	93.4	1.0	9.2	4.8	.925
77.0-78.0	3.8	1.9	93.2	1.1	9.9	4.6	.925
78.0-79.0	5.2	1.8	91.3	1.7	13.4	4.3	.926
79.0-80.0	3.2	2.0	93.7	1.1	8.3	4.8	.923
80.0-81.0	3.5	2.1	93.1	1.3	9.2	5.0	.924
81.0-82.0	4.7	1.8	92.2	1.3	12.3	4.3	.925
82.0-83.0	4.2	1.8	92.7	1.3	10.9	4.3	.924
83.0-84.0	4.4	2.1	92.3	1.2	11.5	5.0	.924
84.0-85.0	5.2	2.0	91.6	1.2	13.5	4.8	.925
85.0-86.0	5.2	1.9	91.4	1.5	13.5	4.6	.926
86.0-87.0	5.4	1.6	91.4	1.6	14.1	3.8	.921
87.0-88.0	5.2	1.7	91.7	1.4	13.6	4.1	.919
88.0-89.0	5.2	1.5	91.9	1.4	13.5	3.6	.916
89.0-90.0	5.5	1.7	91.2	1.6	14.4	4.1	.919
90.0-91.0	5.3	1.1	92.3	1.3	13.7	2.6	.920
91.0-92.0	2.4	2.0	94.8	.8	6.2	4.8	.925
92.0-93.0	2.5	2.3	94.0	1.2	6.6	5.5	.926
93.0-94.0	.9	1.6	96.9	.6	2.4a	3.8	.920
94.0-95.0	3.5	.6	94.7	1.2	9.0	1.4	.919
95.0-96.0	3.6	.7	94.0	1.7	9.4	1.7	.916

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3A(Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
96.0-97.0		4.6	0.9	93.1	1.4	12.1	2.2	0.912
97.0-98.0		3.6	1.2	94.1	1.1	9.4	2.9	.919
98.0-99.0		2.8	.9	95.5	.8	7.3	2.2	.913
99.0-100.0		3.2	1.1	94.5	1.2	8.4	2.6	.919
100.0-101.0		3.0	1.2	94.9	.9	7.8	2.9	.924
101.0-102.0		2.5	1.2	95.5	.8	6.5	2.9	.919
102.0-103.0		3.5	.7	94.8	1.0	9.3	1.7	.914
103.0-104.0		4.5	.6	93.5	1.4	11.7	1.4	.916
104.0-105.0		2.0	.9	96.4	.7	5.3	2.2	.919
105.0-106.0		2.0	.9	96.5	.6	5.2a	2.2	.920
106.0-107.0		1.3	1.1	97.1	.5	3.4a	2.6	.920
107.0-108.0		1.0	1.4	96.8	.8	2.6a	3.4	.920
108.0-109.0		4.3	1.3	93.2	1.2	11.3	3.1	.916
109.0-110.0		11.5	2.1	83.6	2.8	30.1	5.0	.919
110.0-111.0		10.2	1.8	85.4	2.6	26.8	4.3	.915
111.0-112.0		9.2	1.9	86.7	2.2	24.0	4.6	.915
112.0-113.0		5.4	1.8	91.0	1.8	14.1	4.3	.923
113.0-114.0		6.9	1.6	89.3	2.2	18.0	3.8	.918
114.0-115.0		4.3	1.7	92.7	1.3	11.2	4.1	.919
115.0-116.0		8.0	1.6	88.5	1.9	20.8	3.8	.918
116.0-117.0		9.7	1.9	86.2	2.2	25.4	4.6	.915
117.0-118.0		7.5	1.5	89.3	1.7	19.7	3.6	.914
118.0-119.0		13.4	2.0	81.4	3.2	34.9	4.8	.917
119.0-120.0		9.6	1.6	86.2	2.6	25.1	3.8	.918
120.0-121.0		9.0	2.0	86.9	2.1	23.6	4.8	.915
121.0-122.0		8.3	2.0	87.6	2.1	21.6	4.8	.918
122.0-123.0		9.9	2.0	85.9	2.2	25.9	4.8	.913
123.0-124.0		6.6	2.0	89.9	1.5	17.3	4.8	.914
124.0-125.0		5.8	1.5	90.9	1.8	15.1	3.6	.919
125.0-126.0		5.5	1.6	91.7	1.2	14.5	3.8	.916
126.0-127.0		6.1	1.9	90.8	1.2	16.0	4.6	.918
127.0-128.0		8.7	2.0	86.8	2.5	22.7	4.8	.920
128.0-129.0		8.3	2.0	87.5	2.2	21.9	4.8	.912
129.0-130.0		8.7	1.8	87.2	2.3	22.8	4.3	.913
130.0-131.0		6.2	2.3	90.2	1.3	16.1	5.5	.923
131.0-132.0		6.0	2.1	90.1	1.8	15.6	5.0	.915
132.0-133.0		4.6	2.2	91.7	1.5	12.2	5.3	.916
133.0-134.0		4.2	2.0	92.6	1.2	11.0	4.8	.917
134.0-135.0		4.0	2.4	92.4	1.2	10.5	5.8	.916
135.0-136.0		4.1	1.8	93.0	1.1	10.7	4.3	.919
136.0-137.0		3.5	2.1	92.9	1.5	9.0	5.0	.923
137.0-138.0		2.6	2.5	94.0	.9	6.7	6.0	.923
138.0-139.0		3.3	1.6	94.1	1.0	8.6	3.8	.927
139.0-140.0		3.8	1.6	93.5	1.1	9.8	3.8	.926

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3A (Continued)

Depth From - To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
140.0-141.0	5.2	2.1	91.2	1.5	13.7	5.0	.918
141.0-142.0	4.8	2.0	91.8	1.4	12.5	4.8	.920
142.0-143.0	3.1	2.1	93.4	1.4	8.0	5.0	.924
143.0-144.0	2.5	.9	95.4	1.2	6.5	2.2	.917
144.0-145.0	2.4	1.4	95.4	.8	6.3	3.4	.920
145.0-146.0	3.0	2.3	93.6	1.1	7.8	5.5	.924
146.0-147.0	1.8	1.5	96.2	.5	4.6a	3.6	.920
147.0-148.0	2.1	1.4	95.8	.7	5.5	3.4	.922
148.0-149.0	3.6	1.6	93.5	1.3	9.4	3.8	.923
149.0-150.0	5.8	2.3	90.3	1.6	15.1	5.5	.923
150.0-151.0	9.9	1.7	86.2	2.2	26.1	4.1	.910
151.0-152.0	3.8	2.3	92.8	1.1	9.9	5.5	.919
152.0-153.0	2.7	2.6	93.8	.9	7.0	6.2	.921
153.0-154.0	4.4	2.9	91.3	1.4	11.6	7.0	.916
154.0-155.0	2.5	2.1	94.6	.8	6.5	5.0	.922
155.0-156.0	1.4	1.8	96.2	.6	3.7a	4.3	.920
156.0-157.0	0.9	1.5	97.2	0.4	2.3a	3.6	.920
157.0-158.0	2.0	1.9	95.4	.7	5.3	4.6	.922
158.0-159.0	3.0	2.7	92.9	1.4	7.9	6.5	.922
159.0-160.0	3.4	2.2	93.3	1.1	8.9	5.3	.923
160.0-161.0	3.4	2.2	93.2	1.2	8.8	5.3	.923
161.0-162.0	1.4	1.1	96.7	.8	3.7a	2.6	.920
162.0-163.0	3.1	1.8	94.1	1.0	8.1	4.3	.927
163.0-164.0	5.6	2.1	89.9	2.4	14.5	5.0	.926
164.0-165.0	3.3	2.4	93.0	1.3	8.7	5.8	.919
165.0-166.0	4.1	2.0	92.7	1.2	10.8	4.8	.916
166.0-167.0	1.8	2.3	95.4	.5	4.7a	5.5	.920
167.0-168.0	1.6	2.1	95.6	.7	4.1a	5.0	.920
168.0-169.0	1.8	1.8	95.7	.7	4.7a	4.3	.920
169.0-170.0	2.2	1.9	95.2	.7	5.6	4.6	.917
170.0-171.0	2.6	2.6	93.8	1.0	6.9	6.2	.916
171.0-172.0	1.9	2.0	95.4	.7	4.9a	4.8	.920
172.0-173.0	1.7	1.9	95.2	1.2	4.5a	4.6	.920
173.0-174.0	2.0	2.3	94.8	.9	5.2a	5.5	.920
174.0-175.0	1.3	1.6	96.3	.8	3.3a	3.8	.920
175.0-176.0	2.0	1.9	95.5	.6	5.3	4.6	.916
176.0-177.0	7.1	2.4	88.7	1.8	18.7	5.8	.916
177.0-178.0	6.1	2.0	90.7	1.2	16.0	4.8	.913
178.0-179.0	8.6	3.3	86.0	2.1	22.6	7.9	.916
179.0-180.0	3.5	2.2	93.1	1.2	9.2	5.3	.921
180.0-181.0	3.6	2.2	93.1	1.1	9.3	5.3	.922
181.0-182.0	3.0	2.4	93.5	1.1	7.9	5.8	.921
182.0-183.0	2.4	2.7	94.1	.8	6.1	6.5	.919
183.0-184.0	3.3	2.6	93.0	1.1	8.5	6.2	.916
184.0-185.0	2.6	1.9	94.7	.8	6.7	4.6	.918
185.0-186.0	3.2	2.0	93.7	1.1	8.4	4.8	.914

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3A (Continued)

Depth From To	Yield of product: Weight percent Oil	Water	Spent shale	Gas + loss	Gal per ton Oil[1/]	Water	Specific gravity of oil at 60°/60° F
186.0-187.0	2.3	1.9	95.2	0.6	5.9	4.6	0.920
187.0-188.0	1.7	1.6	95.9	.8	4.5a	3.8	.920
188.0-189.0	1.3	1.5	96.6	.6	3.4a	3.6	.920
189.0-190.0	4.4	1.5	92.8	1.3	11.6	3.6	.915
190.0-191.0	5.0	2.1	91.4	1.5	12.9	5.0	.924
191.0-192.0	4.5	2.2	91.9	1.4	11.6	5.3	.925
192.0-193.0	4.7	2.2	91.9	1.2	12.2	5.3	.927
193.0-194.0	3.7	2.0	93.2	1.1	9.6	4.8	.930
194.0-195.0	3.2	2.0	93.9	.9	8.1	4.8	.934
195.0-196.0	2.3	2.4	94.4	.9	6.0	5.8	.933
196.0-197.0	3.3	2.2	93.3	1.2	8.4	5.3	.938
197.0-198.0	2.7	2.0	94.8	.5	6.8	4.8	.937
198.0-199.0	1.9	1.8	95.7	.6	5.0a	4.3	.920
199.0-200.0	2.1	1.9	95.5	.5	5.3	4.6	.935
200.0-201.0	2.1	2.1	95.0	.8	5.4	5.0	.931
201.0-202.0	2.1	2.3	94.9	.7	5.3	5.5	.929
202.0-203.0	2.3	2.0	95.0	.7	6.1	4.8	.926
203.0-204.0	9.0	2.5	86.4	2.1	23.5	6.0	.921
204.0-205.0	8.1	2.2	87.8	1.9	20.9	5.3	.929
205.0-206.0	5.4	1.9	91.5	1.2	13.8	4.6	.934
206.0-207.0	2.6	2.0	94.7	.7	6.7	4.8	.930
207.0-208.0	1.4	1.3	96.3	1.0	3.6a	3.1	.920
208.0-209.0	2.7	1.3	95.2	.8	7.0	3.1	.928
209.0-210.0	2.7	1.0	94.9	1.4	7.0	2.4	.934
210.0-211.0	2.2	1.6	95.6	.6	5.6	3.8	.931
211.0-212.0	2.1	1.6	95.7	.6	5.4	3.8	.930
212.0-213.0	1.9	1.7	95.8	.6	4.8a	4.1	.920
213.0-214.0	1.9	1.5	96.0	.6	4.8a	3.6	.920
214.0-215.0	1.5	1.9	96.0	.6	3.9a	4.6	.920
215.0-216.0	2.5	1.7	95.1	.7	6.5	4.1	.927
216.0-217.0	2.8	1.9	94.5	0.8	7.4	4.6	0.920
217.0-218.0	3.3	2.2	93.5	1.0	8.6	5.3	.915
218.0-219.0	3.6	2.2	92.4	1.8	9.5	5.3	.915
219.0-220.0	3.3	2.9	92.7	1.1	8.6	7.0	.914
220.0-221.0	3.0	1.9	94.4	.7	7.7	4.6	.921
221.0-222.0	2.2	2.3	94.8	.7	5.9	5.5	.919
222.0-223.0	4.4	2.5	91.8	1.3	11.5	6.0	.917
223.0-224.0	5.2	2.1	91.5	1.2	13.5	5.0	.929
224.0-225.0	4.0	1.8	93.2	1.0	10.2	4.3	.934
225.0-226.0	3.4	1.7	93.8	1.1	8.7	4.1	.931
226.0-227.0	2.6	1.8	94.9	.7	6.7	4.3	.932
227.0-228.0	2.8	2.1	94.6	.5	7.1	5.0	.935
228.0-229.0	2.4	1.9	95.2	.5	6.3	4.6	.932
229.0-230.0	2.1	1.6	95.7	.6	5.3	3.8	.932

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3A (Continued)

Depth From-To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
230.0-231.0	1.9	1.3	96.3	.5	4.9a	3.1	.920
231.0-232.0	3.4	1.5	94.6	.5	8.8	3.6	.925
232.0-233.0	4.8	1.8	92.2	1.2	12.5	4.3	.925
233.0-234.0	5.1	2.3	91.3	1.3	13.1	5.5	.931
234.0-235.0	4.1	2.0	92.7	1.2	10.7	4.8	.929
235.0-236.0	4.6	2.1	92.2	1.1	11.7	5.0	.936
236.0-237.0	3.9	2.2	92.4	1.5	10.0	5.3	.938
237.0-238.0	2.9	2.3	93.9	.9	7.3	5.5	.930
238.0-239.0	3.7	2.8	92.6	.9	9.5	6.7	.929
239.0-240.0	4.3	1.7	92.9	1.1	11.2	4.1	.922
240.0-241.0	3.0	1.7	94.6	.7	7.7	4.1	.919
241.0-242.0	4.0	1.1	93.7	1.2	10.5	2.6	.914
242.0-243.0	3.0	1.2	94.8	1.0	7.9	2.9	.917
243.0-244.0	.6	.9	97.9	.6	1.6a	2.2	.920
244.0-245.0	.6	.9	98.1	.4	1.6a	2.2	.920
245.0-246.0	.6	1.1	97.5	.8	1.6a	2.6	.920
246.0-247.0	0.9	1.1	97.6	0.4	2.2a	2.6	.920
247.0-248.0	1.0	1.1	97.5	.4	2.7a	2.6	.920
248.0-249.0	1.1	1.2	97.2	.5	2.9a	2.9	.920
249.0-250.0	.7	1.2	97.7	.4	1.8a	2.9	.920
250.0-251.0	.8	1.2	97.6	.4	2.0a	2.9	.920
251.0-252.0	.7	1.2	97.7	.4	1.8a	2.9	.920
252.0-253.0	4.8	1.0	92.9	1.3	12.5	2.4	0.921
253.0-254.0	6.8	2.9	88.6	1.7	17.7	7.0	.921
254.0-255.0	6.4	2.4	89.4	1.8	16.5	5.8	.924
255.0-256.0	1.5	1.5	96.1	.9	3.8a	3.6	.920
256.0-257.0	1.4	1.9	96.0	.7	3.6a	4.6	.920
257.0-258.0	1.6	1.1	96.1	1.2	4.2a	2.6	.920
258.0-259.0	4.0	2.0	92.8	1.2	10.4	4.8	.929
259.0-260.0	3.3	1.7	94.0	1.0	8.6	4.1	.926
260.0-261.0	3.6	1.2	94.2	1.0	9.3	2.9	.924
261.0-262.0	2.6	1.3	95.4	.7	6.7	3.1	.923
262.0-263.0	2.8	1.2	95.2	.8	7.3	2.9	.923
263.0-264.0	2.6	1.1	95.6	.7	6.8	2.6	.923
264.0-265.0	1.5	1.3	96.6	.6	3.8a	3.1	.920
265.0-266.0	2.6	2.1	94.3	1.0	6.6	5.0	.935
266.0-267.0	2.4	2.5	94.5	.6	6.3	6.0	.930
267.0-268.0	2.8	1.6	94.9	.7	7.2	3.8	.932
268.0-269.0	3.0	1.4	95.0	.6	7.7	3.4	.930
269.0-270.0	2.8	1.2	95.4	.6	7.1	2.9	.929
270.0-271.0	1.2	1.4	97.0	.4	3.0a	3.4	.920
271.0-272.0	2.6	2.2	94.6	.6	6.8	5.3	.930
272.0-273.0	3.2	2.5	93.5	.8	8.3	6.0	.929
273.0-274.0	2.8	1.8	94.8	.6	7.1	4.3	.930
274.0-275.0	5.4	2.4	90.9	1.3	14.0	5.8	.933
275.0-276.0	4.4	2.4	92.2	1.0	11.4	5.8	.931

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-3A (Continued)

Depth From–To	Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil[1/]	Gal per ton: Water	Specific gravity of oil at 60°/60° F
276.0-277.0	4.3	1.3	93.3	1.1	10.9	3.1	0.934
277.0-278.0	3.9	1.2	93.6	1.3	10.0	2.9	.936
278.0-279.0	3.5	1.3	94.3	.9	9.1	3.1	.937
279.0-280.0	3.5	1.0	94.6	.9	8.9	2.4	.937
280.0-281.0	3.5	1.1	94.4	1.0	9.0	2.6	.941
281.0-282.0	3.2	1.2	94.8	.8	8.2	2.9	.938
282.0-283.0	2.5	2.0	94.8	.7	6.4	4.8	.937
283.0-284.0	2.2	2.7	94.2	.9	5.5	6.5	.941
284.0-285.0	2.1	1.3	96.2	.4	5.3	3.1	.930
285.0-286.0	1.5	2.8	95.2	.5	3.9a	6.7	.920
286.0-287.0	2.1	2.4	94.9	.6	5.3	5.8	.935
287.0-288.0	3.1	.7	95.6	.6	8.0	1.7	.928
288.0-289.0	2.7	.5	96.0	.8	7.0	1.2	.924
289.0-290.0	2.8	.6	95.9	.7	7.3	1.4	.924
290.0-291.0	3.1	.7	95.3	.9	7.9	1.7	.925
291.0-292.0	3.4	1.1	94.8	.7	8.9	2.6	.927
292.0-293.0	3.8	.9	94.3	1.0	9.7	2.2	.932
293.0-294.0	8.4	2.2	87.5	1.9	21.5	5.3	.932
294.0-295.0	3.9	3.7	91.4	1.0	9.9	8.9	.939
295.0-296.0	4.1	3.2	91.8	.9	10.4	7.7	.940
296.0-297.0	4.2	2.7	92.2	.9	10.7	6.5	.936
297.0-298.0	4.6	2.0	92.3	1.1	11.7	4.8	.936
298.0-299.0	2.9	1.5	95.0	.6	7.5	3.6	.940
299.0-300.0	2.4	1.5	95.6	.5	6.1	3.6	.936
300.0-301.0	4.7	1.6	92.7	1.0	11.9	3.8	.939
301.0-301.6	4.0	1.7	93.3	1.0	10.1	4.1	.940

1/ "a"—indicates specific gravity estimated as 0.92.

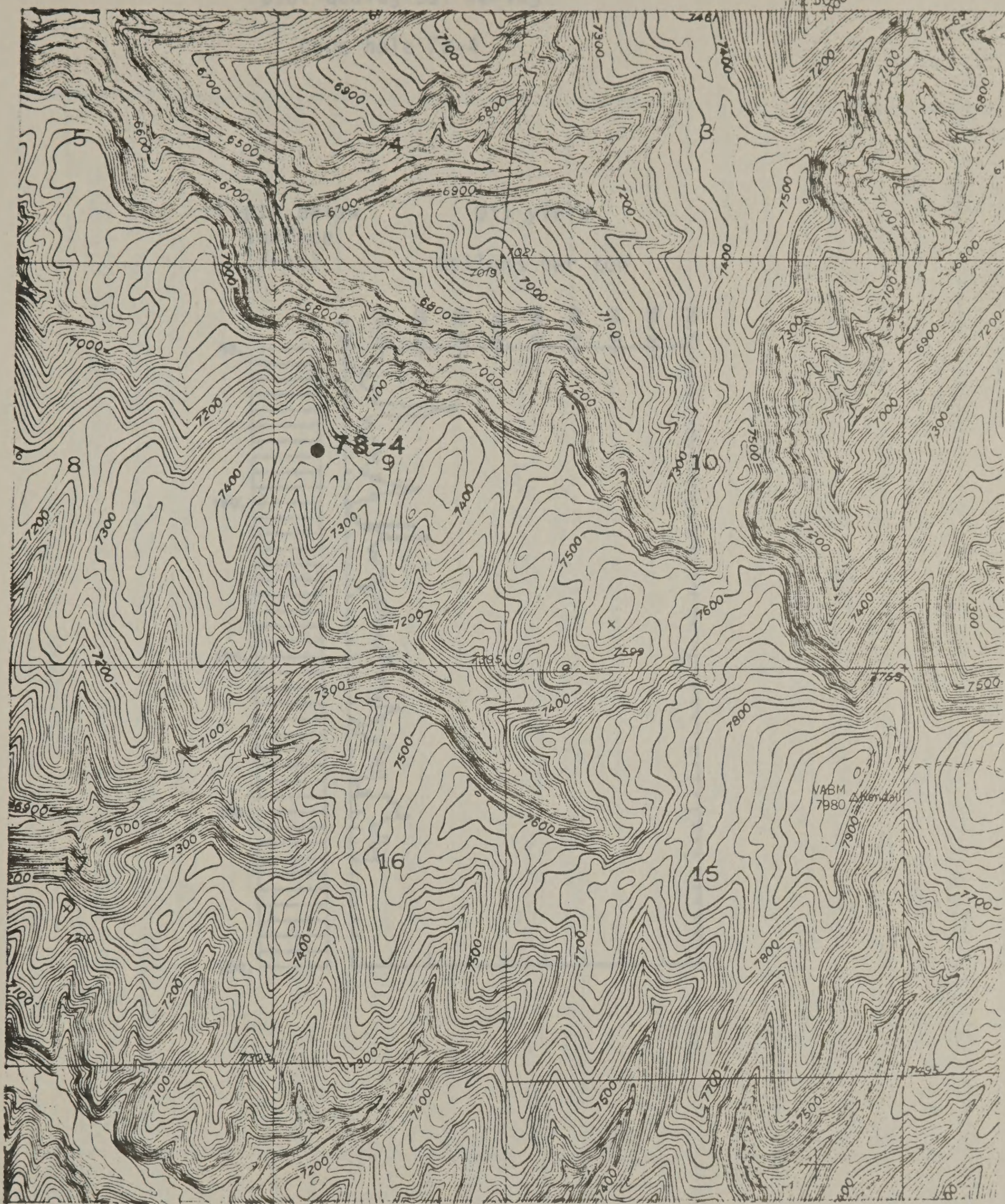
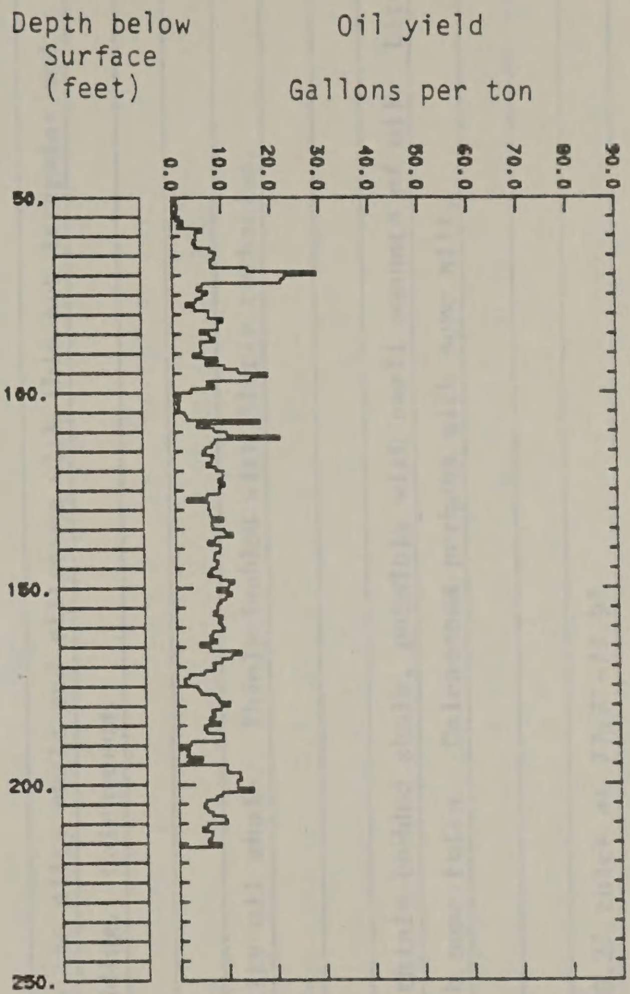


Figure 5.--Map showing location of core hole 78-4. Base from Segar Mountain Quadrangle (1952). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-4



Corehole 78-4
Logged by Kurt Hollocher

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
20.0'	50.5'		Gray to oxidized yellow brown fine to coarse grained sandstone and siltstone interbedded with minor silty shale. Calcite cemented with disturbed, irregular bedding. Pyrite nodules common. Most parts porous and water saturated.
50.5'	69.1'		Light-gray to tan silty shale and siltstone with thin but irregular and disturbed bedding. Calcareous.
69.1'	71.9'		Brown lean silty oil shale. Thinly bedded with little turbation. Noncalcareous.
71.9'	106.2'		Brown to tan thinly bedded shale, possibly with small amounts of oil. Little turbation with some tuffs. Calcareous perhaps with some silt.
			Tuff 0.2' thick at 77.7'-77.9'
			Tuff 0.2' thick at 85.8'-86.0'
			Tuff 0.6' thick at 88.7'-89.3' with minor shale
			Tuff 0.25' thick at 90.5'-90.75' with minor shale
			Dark brown bed without smell of oil, otherwise similar to rest of this unit, 93.7'-97.0', 3.3' thick.
			Tuff 0.1' thick at 96.7'
			Tuff 0.1' thick at 100.1'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Fine-grained calcite cemented sandstone 0.4' thick at 102.8'-103.2'
			with crossbedding
106.2'	220.0		Brown to dark-brown oil shale, lean and somewhat calcareous. Thinly bedded
			with little turbation. Somewhat silty in parts. Carbonized plant impressions
			common.
			Dark-brown moderately lean oil shale 0.4' thick at 107.5'-197.9'
			Dark-brown moderately lean oil shale 0.7' thick at 111.2'-111.9'
			Well sorted gray siltstone 0.3' thick at 121.1'-121.4'
			gray siltstone 0.3' thick at 122.1'-122.4'
			Sandstone and gray siltstone 0.6' thick at 127.4'-128.0'
			Sandstone and gray siltstone 1.1' thick at 137.3'-138.4' with some shale
			Sandstone and gray siltstone 0.1' thick at 139.3'
			Sandstone and gray siltstone 0.3' thick at 154.1'-154.4' with some shale
			Sandstone and gray siltstone 0.2' thick at 156.2'-156.4'
			Sandstone and gray siltstone 0.4' thick at 161.7'-162.1' with some shale
			White siltstone 0.1' thick at 162.8'
			Gray siltstone 0.1' thick at 164.5'
			Sandstone 0.1' thick at 171.1'
			Tuff 0.1' thick at 172.2'
			Unit of sandstone, gray and coarse grained with shale beds and parts with shale
			chips. Calcite cemented with most parts porous and water saturated with others
			massive 6.1' thick at 188.7'-194.8'

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-4 drilled in sec. 9, T 1S., R. 95W., Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
50	51			97.5	0.4	TRACE	5.0	——
51	52			97.6	0.5	0.92	3.7	.920 *
52	53			97.6	0.3	1.2	3.9	.920 *
53	54			96.4	0.8	0.96	5.8	.920 *
54	55			96.6	0.9	TRACE	6.1	——
55	56			97.4	0.2	1.0	4.7	.920 *
56	57			96.5	0.4	2.3	5.8	.920 *
57	58			97.7	0.2	1.2	4.1	.920 *
58	59			93.9	0.6	6.1	7.6	.916
59	60			94.9	0.3	4.7	7.3	.908
60	61			94.7	0.6	4.9	6.9	.920 *
61	62			95.5	0.5	4.2	5.9	.900
62	63			95.0	0.4	4.7	6.6	.920 *
63	64			92.4	1.5	7.7	7.7	.900
64	65			92.1	1.3	8.9	7.6	.903
65	66			92.1	1.5	8.6	7.7	.912
66	67			94.1	0.8	7.8	4.9	.915
67	68			94.1	0.8	7.9	5.0	.914
68	69			90.2	1.3	15.4	6.5	.907
69	70			80.8	5.6	29.4	5.8	.909
70	71			85.9	2.6	22.9	6.3	.925
71	72			86.2	2.4	22.1	6.3	.946
72	73			95.1	0.8	6.0	4.4	.926
73	74			94.8	1.2	5.0	4.9	.926
74	75			94.3	0.8	7.1	5.0	.930
75	76			94.6	1.0	6.0	5.1	.913
76	77			95.3	1.0	4.7	4.4	.914
77	78			96.4	0.7	2.7	4.4	.920 *
78	79			95.7	0.8	4.4	4.6	.905
79	80			93.8	1.4	7.3	4.8	.919

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-4 (Continued)

Depth From	Depth To	Yield of product: Weight percent Oil	Water	Spent shale	Gas + loss	Gal per ton Oil	Water	Specific gravity of oil at 60°/60° F
80	81			94.1	1.2	7.3	4.5	.919
81	82			93.7	0.4	10.2	4.8	.918
82	83			92.9	1.1	9.1	6.0	.922
83	84			92.5	1.7	9.2	5.5	.918
84	85			93.8	1.2	5.5	6.9	.916
85	86			92.4	1.4	7.5	7.8	.918
86	87			93.1	1.2	8.5	5.7	.945
87	88			93.5	1.2	5.5	7.6	.920
88	89			93.4	1.0	5.6	8.2	.928
89	90			93.1	1.2	5.8	8.3	.935
90	91			94.1	0.9	4.0	8.4	.925
91	92			92.8	1.5	9.1	5.5	.914
92	93			93.0	1.9	6.6	6.3	.923
93	94			91.9	1.5	10.5	6.4	.912
94	95			88.3	3.4	13.2	7.7	.923
95	96			86.8	2.6	19.2	7.8	.919
96	97			87.3	2.9	15.7	9.1	.917
97	98			95.4	0.7	6.7	3.2	.908
98	99			94.7	0.5	8.3	3.8	.902
99	100			96.4	0.6	3.6	3.8	.920 *
100	101			98.9	<0.1	0.8	3.0	.920 *
101	102			97.9	0.2	1.3	3.4	.920 *
102	103			98.3	<0.1	0.8	3.5	.920 *
103	104			98.0	0.3	1.1	3.2	.920 *
104	105			97.5	0.1	0.9	5.0	.920 *
105	106			96.6	0.5	2.2	5.0	.920 *
106	107			96.3	<0.1	2.6	5.4	.920 *
107	108			89.5	1.5	17.6	5.6	.914
108	109			94.1	1.6	4.6	6.1	.920 *
109	110			92.8	1.3	8.1	6.6	.920
110	111			91.5	1.1	10.8	7.6	.928
111	112			86.6	2.0	21.5	7.6	.917
112	113			93.2	1.1	8.2	6.0	.922
113	114			93.6	1.1	7.7	5.7	.917
114	115			95.8	<0.1	6.3	4.5	.911

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-4 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
115	116			96.2	<0.1	5.7	4.2	.920*
116	117			94.2	0.1	7.9	6.2	.924
117	118			93.5	0.4	7.5	7.6	.928
118	119			94.8	0.4	6.5	5.6	.914
119	120			93.8	0.9	8.4	5.0	.925
120	121			91.8	1.7	10.0	6.3	.927
121	122			90.8	1.5	9.7	9.3	.935
122	123			92.7	1.4	8.9	5.8	.921
123	124			91.7	2.4	10.1	4.9	.920
124	125			93.6	1.0	9.0	4.7	.922
125	126			93.7	1.2	9.1	3.7	.930
126	127			95.3	0.6	6.5	3.7	.922
127	128			94.3	0.4	2.4	10.6	.920*
128	129			94.8	1.3	6.9	3.0	.922
129	130			95.4	0.9	6.7	2.9	.919
130	131			94.5	1.7	7.1	2.5	.920
131	132			95.6	0.4	7.3	2.7	.921
132	133			94.7	0.6	9.7	2.3	.920
133	134			95.0	0.5	7.3	4.1	.928
134	135			94.2	0.3	7.6	4.9	.923
135	136			92.5	1.5	10.1	4.9	.921
136	137			91.0	1.8	11.7	6.5	.932
137	138			92.2	1.2	8.0	8.4	.922
138	139			93.1	1.0	6.6	7.3	.929
139	140			93.4	0.4	9.1	6.2	.929
140	141			93.6	0.7	9.0	5.4	.926
141	142			94.2	0.6	7.9	5.2	.933
142	143			94.7	0.2	7.8	4.9	.946
143	144			93.9	0.6	8.6	5.2	.935
144	145			94.0	0.5	8.3	5.4	.933
145	146			93.8	1.0	7.2	5.8	.937
146	147			95.4	0.2	6.5	4.5	.919
147	148			94.0	0.8	9.0	4.0	.928
148	149			92.8	0.3	11.8	3.8	.946
149	150			92.7	1.2	10.7	4.7	.935

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-4 (Continued)

Depth		Yield of products						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
150	151			93.9	1.1	8.3	4.1	.934
151	152			93.9	0.8	11.3	2.3	.923
152	153			93.3	1.6	10.1	2.8	.938
153	154			93.9	1.3	9.0	3.0	.918
154	155			94.3	1.1	8.3	3.5	.923
155	156			93.8	1.3	8.3	4.1	.920
156	157			92.6	1.5	7.5	7.1	.942
157	158			92.5	1.6	9.3	5.8	.919
158	159			93.6	0.8	8.5	5.6	.922
159	160			93.3	0.9	9.2	5.4	.924
160	161			92.8	1.1	9.7	5.6	.932
161	162			93.2	0.9	7.3	7.5	.928
162	163			94.0	0.8	6.7	6.1	.923
163	164			93.8	1.1	8.1	4.9	.921
164	165			95.8	0.7	4.7	4.1	.911
165	166			94.8	0.8	6.8	4.1	.936
166	167			91.9	1.8	13.1	2.9	.916
167	168			92.8	1.5	11.1	3.4	.916
168	169			93.5	1.9	9.1	2.8	.921
169	170			95.6	<0.1	7.3	4.3	.922
170	171			95.4	<0.1	7.7	3.8	.914
171	172			96.2	0.1	5.5	3.8	.927
172	173			98.1	<0.1	2.4	3.0	.920 *
173	174			98.0	<0.1	1.4	3.5	.920 *
174	175			97.8	<0.1	1.8	3.5	.920 *
175	176			96.3	0.2	4.1	4.7	.920 *
176	177			96.1	0.3	4.7	4.5	.920 *
177	178			94.3	0.5	7.9	5.2	.904
178	179			94.9	0.2	8.4	4.2	.912
179	180			93.3	0.8	10.6	4.4	.913
180	181			92.6	2.4	8.8	4.1	.913
181	182			93.5	1.5	7.0	5.5	.919
182	183			93.2	1.5	7.5	5.8	.916
183	184			93.6	1.4	6.4	6.2	.904
184	185			92.6	1.5	8.6	6.3	.907

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-4 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
185	186			93.7	1.5	5.4	6.5	.902
186	187			94.2	1.9	5.8	6.0	.909
187	188			92.7	1.6	9.2	5.3	.920
188	189			92.9	1.5	9.2	5.1	.913
189	190			96.0	0.4	2.5	6.4	.920 *
190	191			96.1	1.0	0.1	5.9	.920 *
191	192			95.0	0.6	2.2	8.6	.920 *
192	193			96.1	0.8	1.7	6.0	.920 *
193	194			95.5	0.3	4.9	4.2	.920 *
194	195			96.3	0.7	1.7	5.6	.920 *
195	196			93.4	0.9	10.0	4.4	.935
196	197			93.4	0.8	9.9	4.5	.924
197	198			92.1	1.3	12.6	4.1	.927
198	199			92.2	1.2	12.8	4.1	.926
199	200			92.8	0.9	12.0	4.0	.918
200	201			92.5	1.2	12.0	4.2	.920
201	202			89.3	2.7	15.2	5.3	.923
202	203			94.1	0.3	8.6	4.2	.922
203	204			94.9	0.5	7.7	3.9	.927
204	205			95.9	0.4	5.5	3.6	.939
205	206			96.4	0.2	5.0	3.7	.924
206	207			96.0	0.7	5.8	2.9	.915
207	208			94.7	1.1	6.9	3.6	.931
208	209			94.8	0.2	9.4	3.2	.936
209	210			93.5	1.4	9.3	3.2	.921
210	211			94.8	1.3	5.8	3.8	.919
211	212			96.1	0.4	4.7	4.1	.912
212	213			95.9	<0.1	6.8	3.3	.923
213	214			95.1	1.0	6.5	3.4	.920
214	215			95.3	0.9	5.8	3.8	.920
215	216			95.5	<0.1	8.4	3.5	.915

* Assumed Specific Gravity

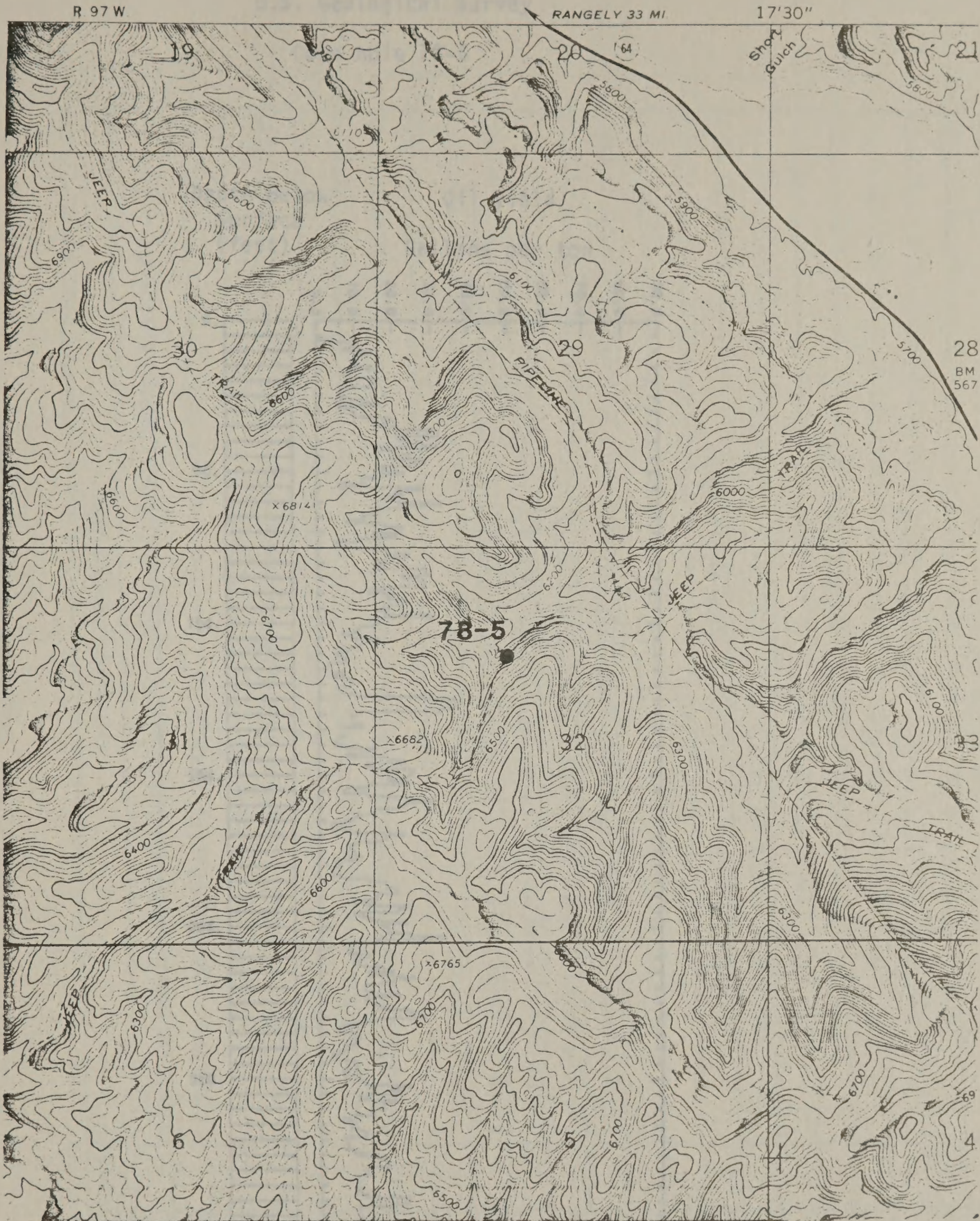
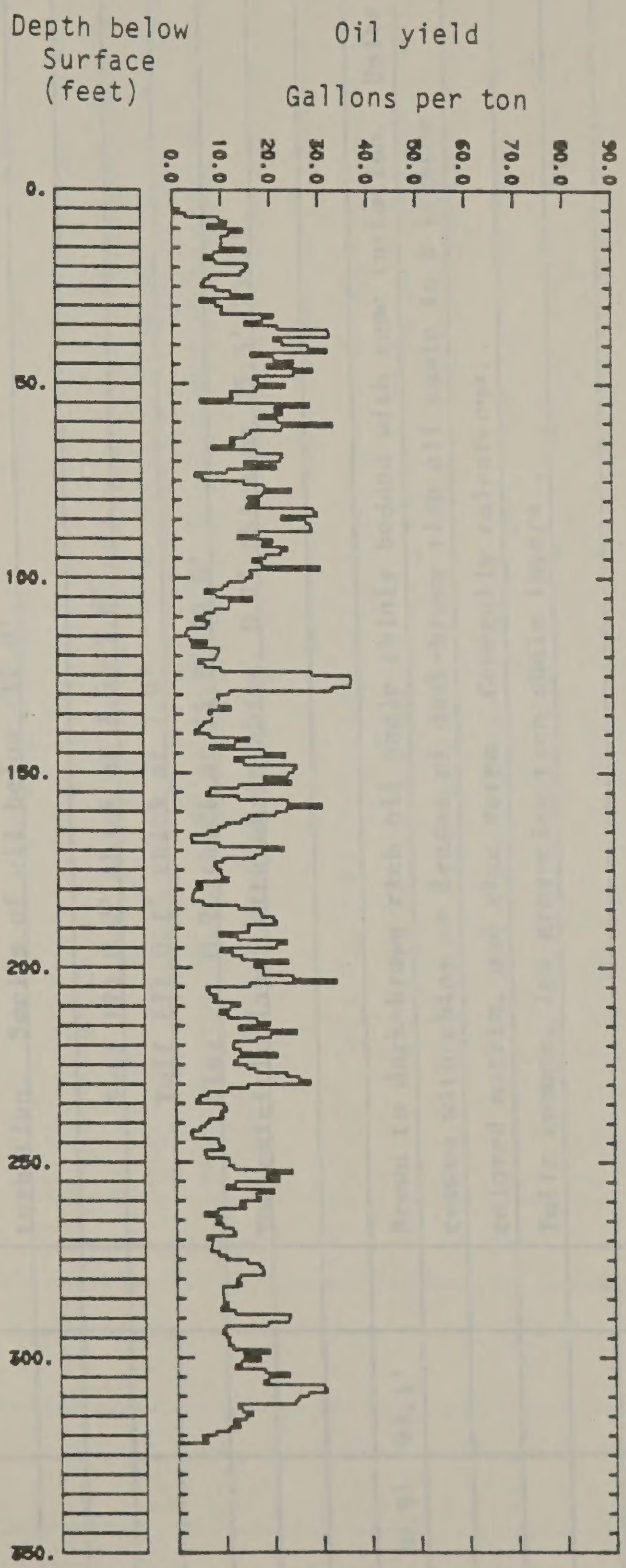


Figure 6.--Map showing location of core hole 78-5. Base from Barcus Creek SE. Quadrangle (1966). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-5



Corehole 78-5

Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
6.0'	30.9'		Brown to light brown weathered shale, generally thinly bedded with some
			turbation. Smells of oil below -12.0'.
			Tuff (?) 0.2' thick at 7.6'-7.8'
			Tuff (?) 0.1' thick at 7.9'
			Clay 0.2' thick at 11.8'-12.0'
			Tan calcitic layer with shale chips, 0.2' thick at 25.5'-25.7'
30.9'	97.1'		Brown to dark-brown rich oil shale thinly bedded with some turbation. Units
			common with chips or lenses of dark-brown rich oil shale in a lighter
			colored matrix, and vice versa. Generally calcareous.
			Tuffs common, few gray-clay rich shale layers
			Tuff 0.2' thick at 37.3'-37.5' with minor shale
			Tuff 0.1' thick at 38.7'
			Tuff 0.2' thick at 49.3'-49.5'
			Tuff 0.4' thick at 51.0'-51.4' with minor shale
			Tuff 0.1' thick at 55.8'
			Tuff 0.1' thick at 68.1' with minor shale
			Tuff 0.1' thick at 72.1'
			Tuff 0.3' thick at 72.5'-72.8'
			Tuff 0.1' thick at 79.8'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.2' thick at 93.0'-93.2'
97.1'	177.5'		Dark-gray and gray-brown l[illegible] clay rich oil shale with tan lean to brown moderately-rich oil shale interbedded. Thinly bedded with some distinct tuffs. Virtually noncalcareous.
			Tuff 0.2' thick at 113.4'-113.5'
			Tuff 0.1' thick at 113.8'
			Tuff 0.1' thick at 133.0'
			Tuff 0.2' thick at 146.6'-146.8'
			Tuff 0.1' thick at 147.8'
			Very dark brown rich oil shale, 157.9'-162.2', 5.3' thick
			Tuff 0.1' thick at 165.0'
			Tuff 0.2' thick at 165.6'-165.8'
			Dark-brown rich oil shale 169.0'-172.0', 3.0' thick

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
177.5'	197.8'		Gray to brown somewhat silty shale, lean oil shale. Medium bedding with some
			tuffs. Somewhat calcareous.
			Tuff 0.1' thick at 181.7'
			Tuff 0.1' thick at 191.5'
			Dark brown moderately rich oil shale 192.8'-194.4', 1.6' thick
197.8'	323.0'		Dark brown thinly bedded oil shale with some light brown oil shale and tuffs.
Bottom	of hole		Very clay rich with some calcite
			Tuff 0.1' thick at 205.7'
			Tuff 0.2' thick at 207.7'-207.9'
			Tuff 0.1' thick at 218.1'
			Tuff 0.2' thick at 222.1'-222.3'
			Tuff 0.2' thick at 236.2-236.5'
			Tuff 0.1' thick at 236.8'
			Tuff 0.1' thick at 245.7'
			Tuff 0.2' thick at 246.8'-247.0'
			Tuff 0.1' thick at 248.4'
			Tuff 0.1' thick at 248.8'
			Tuff 0.2' thick at 250.1'-250.3'
			Tuff 0.2' thick at 253.1'-253.3' with minor shale
			Tuff 0.2' thick at 254.5'-254.7'

Corehole 78-5 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.1' thick at 255.8'
			Tuff 0.1' thick at 256.4'
			Limestone 0.2' thick at 260.8'-261.0'
			Limestone 0.25' thick at 265.8'-266.05' ostrocods?
			Sandstone? 0.3' thick at 268.4'-268.7'
			Limestone 0.1' thick at 271.0'
			Limestone 0.2' thick at 275.6'-275.8'
			Limestone 0.1' thick at 282.3'
			Limestone 0.2' thick at 284.2'-284.4'
			Limestone 0.1' thick at 284.9'
			Limestone 0.3' thick at 287.4-287.7'
			Limestone 0.2' thick at 300.3'-300.5'
			Limestone 0.1' thick at 308.7'
			Limestone 0.2' thick at 309.6'-309.8'
			Limestone 0.1' thick at 311.7'
			Limestone 0.25' thick at 318.95'-319.2'
			The hole was capped with a large stone slab and is in service as a Water
			Resources Division observation and test well. Water production with drilling
			fluid probably began between 50-100' depth and slowly increased with increasing
			depth. At 290' water production dropped off, possibly due to loss in lower
			fractures or fluid back pressure sealing.

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Slickenside ranged in dip from -10° to 70° most commonly being 20°-50°. Low angle dips (20°-30°) are particularly common. Fault striations are usually parallel to the dip, rarely perpendicular or oblique.
			Many tuffs, lean marlstones, dolomite, and impure limestones were difficult to distinguish due to similar color and texture and some confusion may have resulted.

Samples from the U.S. Geological Survey's Corehole 78-5 drilled in sec. 32, T 2 N., R. 97 W. Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
6.0	7.0	1.1	2.8	94.8	1.3	2.8a	6.7	
7.0	8.0	3.7	2.8	91.3	2.2	9.7	6.7	0.911
8.0	9.0	4.3	3.7	89.7	2.3	11.3	8.9	.916
9.0	10.0	2.8	3.5	91.9	1.8	7.4	8.4	.903
10.0	11.0	5.5	3.9	87.7	2.9	14.6	9.3	.907
11.0	12.0	4.4	5.4	87.4	2.8	11.6	12.9	.910
12.0	13.0	3.8	3.7	89.8	2.7	10.0	8.9	.900
13.0	14.0	3.9	4.1	89.8	2.2	10.3	9.8	.903
14.0	15.0	3.7	2.9	91.6	1.8	9.9	7.0	.901
15.0	16.0	5.8	5.0	86.6	2.6	15.2	12.0	.913
16.0	17.0	3.2	3.5	91.7	1.6	8.6	8.4	.898
17.0	18.0	2.5	5.0	90.9	1.6	6.7	12.0	.898
18.0	19.0	3.4	4.6	90.3	1.7	9.0	11.0	.903
19.0	20.0	6.0	4.0	87.4	2.6	15.6	9.6	.917
20.0	21.0	5.7	2.5	89.6	2.2	15.0	6.0	.905
21.0	22.0	5.4	2.6	89.2	2.8	14.2	6.2	.914
22.0	23.0	2.9	2.2	92.4	2.5	7.7	5.3	.896
23.0	24.0	2.4	2.8	93.1	1.7	6.6	6.7	.886
24.0	25.0	2.2	2.1	94.4	1.3	6.0	5.0	.887
25.0	26.0	4.6	2.0	91.7	1.7	12.1	4.3	.901
26.0	27.0	6.3	2.2	89.3	2.2	16.6	5.3	.909
27.0	28.0	2.1	2.0	94.3	1.6	5.6	4.8	.897
28.0	29.0	3.3	2.3	93.0	1.4	8.9	5.5	.895
29.0	30.0	3.9	1.9	92.7	1.5	10.3	4.6	.900
30.0	31.0	3.8	2.3	92.3	1.6	10.1	5.5	.899
31.0	32.0	7.9	2.0	87.1	3.0	20.9	4.8	.913
32.0	33.0	7.1	1.9	88.0	3.0	18.5	4.6	.920
33.0	34.0	5.7	2.0	89.6	2.7	14.9	4.8	.920
34.0	35.0	8.3	2.1	85.0	4.6	21.7	5.0	.920
35.0	36.0	12.3	2.5	78.8	6.4	32.1	6.0	.914
36.0	37.0	12.3	2.6	80.6	4.5	32.3	6.2	0.915
37.0	38.0	7.9	2.0	87.5	2.6	20.8	4.8	.908
38.0	39.0	8.6	2.1	86.7	2.6	22.6	5.0	.911
39.0	40.0	10.6	2.9	83.6	2.9	27.9	7.0	.909
40.0	41.0	12.1	2.9	81.9	3.1	31.8	7.0	.908
41.0	42.0	6.1	2.6	89.1	2.2	16.1	6.2	.913
42.0	43.0	8.0	2.2	87.3	2.5	20.9	5.3	.910
43.0	44.0	9.5	2.2	85.7	2.6	25.0	5.3	.914
44.0	45.0	7.4	2.6	87.0	3.0	19.4	6.2	.917
45.0	46.0	11.0	2.4	81.7	4.9	28.9	5.8	.914
46.0	47.0	9.5	2.7	84.2	3.6	24.9	6.5	.913
47.0	48.0	6.3	2.0	89.7	2.0	16.6	4.8	.917
48.0	49.0	6.8	2.0	89.1	2.1	17.7	4.8	.921
49.0	50.0	8.9	2.0	86.8	2.3	23.2	4.8	.924
50.0	51.0							

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-5 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil 1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
51.0	52.0	6.7	1.7	89.5	2.1	17.3	4.1	.922
52.0	53.0	4.4	2.7	91.4	1.5	11.8	6.5	.901
53.0	54.0	4.6	2.8	90.9	1.7	12.4	6.7	.897
54.0	55.0	6.0	3.2	89.0	1.8	5.7	7.7	.911
55.0	56.0	10.8	2.4	83.7	3.1	28.2	5.8	.919
56.0	57.0	8.0	3.0	86.2	2.8	20.9	7.2	.915
57.0	58.0	8.6	2.4	86.2	2.8	22.6	5.8	.911
58.0	59.0	6.8	2.8	87.8	2.6	17.8	6.7	.911
59.0	60.0	8.3	2.2	86.2	3.3	21.6	5.3	.916
60.0	61.0	12.6	2.3	81.6	3.5	32.9	5.5	.915
61.0	62.0	8.6	2.0	86.4	3.0	22.4	4.8	.919
62.0	63.0	6.1	1.9	90.0	2.0	16.0	4.6	.919
63.0	64.0	5.7	2.8	89.7	1.8	15.0	6.7	.913
64.0	65.0	4.4	2.9	90.7	2.0	11.8	7.0	.899
65.0	66.0	4.8	2.8	90.6	1.8	12.7	6.7	.901
66.0	67.0	3.0	3.0	92.4	1.6	8.0	7.2	.892
67.0	68.0	6.6	2.9	87.6	2.9	17.3	7.0	0.913
68.0	69.0	8.6	1.7	86.9	2.8	22.6	4.1	.917
69.0	70.0	8.5	2.4	85.4	3.7	22.1	5.8	.921
70.0	71.0	5.6	3.4	88.7	2.3	14.6	8.1	.920
71.0	72.0	8.2	2.9	86.2	2.7	21.3	7.0	.921
72.0	73.0	4.2	2.5	91.5	1.8	11.1	6.0	.903
73.0	74.0	1.7	2.6	94.8	.9	4.5a	6.2	
74.0	75.0	2.3	2.3	94.1	1.3	6.1	5.5	.896
75.0	76.0	5.6	2.6	90.1	1.7	14.7	6.2	.909
76.0	77.0	7.2	2.7	88.1	2.0	18.8	6.5	.910
77.0	78.0	9.2	2.7	85.3	2.8	24.3	6.5	.912
78.0	79.0	6.9	3.2	87.3	2.6	18.4	7.7	.907
79.0	80.0	5.8	2.8	89.4	2.0	15.3	6.7	.909
80.0	81.0	6.7	2.4	88.4	2.6	17.7	5.8	.906
81.0	82.0	5.7	2.6	89.0	2.7	15.0	6.2	.906
82.0	83.0	10.9	2.5	82.7	3.9	28.9	6.0	.906
83.0	84.0	11.2	2.7	82.8	3.3	29.7	6.5	.904
84.0	85.0	8.4	3.0	85.5	3.1	22.2	7.2	.903
85.0	86.0	10.3	3.1	83.4	3.2	27.3	7.4	.902
86.0	87.0	10.6	2.7	83.6	3.1	28.3	6.5	.903
87.0	88.0	10.8	2.7	83.5	3.0	28.5	6.5	.907
88.0	89.0	6.7	2.7	88.5	2.1	17.6	6.5	.903
89.0	90.0	5.0	3.5	89.7	1.8	13.2	8.4	.902
90.0	91.0	7.8	3.1	85.8	3.3	20.5	7.4	.913
91.0	92.0	7.0	2.1	88.3	2.6	18.3	5.0	.917
92.0	93.0	9.1	1.7	86.1	3.1	23.5	4.1	.924
93.0	94.0	8.5	1.7	87.5	2.3	22.1	4.1	.923
94.0	95.0	7.3	3.1	87.5	2.1	19.0	7.4	.923
95.0	96.0	6.2	3.1	88.9	1.8	16.2	7.4	.913
96.0	97.0	7.0	3.4	87.4	2.2	18.2	8.1	.920

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-5 (Continued)

Depth From - To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
97.0-98.0	11.5	3.0	82.1	3.4	30.2	7.2	0.911
98.0-99.0	5.9	2.9	89.0	2.2	15.5	7.0	.912
99.0-100.0	6.2	2.5	89.4	1.9	16.2	6.0	.917
100.0-101.0	5.6	2.8	89.4	2.2	14.8	6.7	.905
101.0-102.0	4.2	2.4	92.0	1.4	11.2	5.8	.901
102.0-103.0	3.8	3.6	90.6	2.0	10.2	8.6	.893
103.0-104.0	2.3	3.5	93.1	1.1	6.4	8.4	.876
104.0-105.0	3.2	2.7	92.8	1.3	8.7	6.5	.879
105.0-106.0	6.0	2.9	89.0	2.1	16.1	7.0	.896
106.0-107.0	4.2	2.9	91.6	1.3	11.3	7.0	.893
107.0-108.0	4.2	2.4	91.3	2.1	11.3	5.8	.896
108.0-109.0	3.1	3.5	92.2	1.2	8.3	8.4	.894
109.0-110.0	2.3	2.8	93.3	1.6	6.3	6.7	.885
110.0-111.0	1.7	2.9	94.8	.6	4.4a	7.0	
111.0-112.0	2.7	2.9	93.5	.9	7.3	7.0	.889
112.0-113.0	2.5	3.0	93.3	1.2	6.7	7.2	.894
113.0-114.0	1.0	1.4	97.0	.6	2.6a	3.4	
114.0-115.0	.9	2.3	96.0	.8	2.3a	5.5	
115.0-116.0	1.2	2.5	95.6	.7	3.2a	6.0	
116.0-117.0	2.6	2.6	93.0	1.8	6.8	6.2	.906
117.0-118.0	1.4	1.3	95.2	2.1	3.6a	3.1	
118.0-119.0	3.5	2.9	92.0	1.6	9.3	7.0	.901
119.0-120.0	3.3	2.3	92.8	1.6	8.9	5.5	.902
120.0-121.0	3.2	2.3	93.0	1.5	8.5	5.5	.899
121.0-122.0	1.9	1.6	95.1	1.4	4.9a	3.8	
122.0-123.0	2.4	1.6	94.0	2.0	6.4	3.8	.912
123.0-124.0	3.6	1.9	93.0	1.5	9.6	4.6	.908
124.0-125.0	10.8	1.9	84.5	2.8	28.3	4.6	.910
125.0-126.0	13.8	2.1	80.6	3.5	36.3	5.0	.910
126.0-127.0	13.8	2.1	80.6	3.5	36.4	5.0	.906
127.0-128.0	13.7	2.3	79.8	4.2	36.2	5.5	0.910
128.0-129.0	12.3	2.4	81.5	3.8	32.5	5.8	.909
129.0-130.0	4.2	2.2	91.4	2.2	11.2	5.3	.905
130.0-131.0	3.4	2.0	92.6	2.0	8.8	4.8	.909
131.0-132.0	3.4	1.8	92.5	2.2	9.2	4.3	.909
132.0-133.0	3.4	1.9	92.8	1.9	9.1	4.6	.912
133.0-134.0	4.4	1.7	92.1	1.8	11.6	4.1	.910
134.0-135.0	2.6	1.6	94.3	1.5	7.0	3.8	.909
135.0-136.0	3.0	1.8	93.8	1.4	7.8	4.3	.908
136.0-137.0	2.9	2.0	93.5	1.6	7.6	4.8	.910
137.0-138.0	2.3	1.8	94.2	1.7	6.0	4.3	.911
138.0-139.0	2.0	1.9	94.5	1.6	5.2	4.6	.917

Samples from the U.S. Geological Survey's Corehole 78-5 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil 1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
139.0-140.0	1.6	2.2	94.3	1.9	4.1a	5.3	
140.0-141.0	2.7	2.3	93.3	1.7	7.2	5.5	.907
141.0-142.0	5.8	2.0	90.1	2.1	15.4	4.8	.905
142.0-143.0	4.7	1.8	91.5	2.0	12.4	4.3	.907
143.0-144.0	2.7	2.4	93.2	1.7	7.2	5.8	.903
144.0-145.0	7.0	2.0	89.0	2.0	18.4	4.8	.906
145.0-146.0	8.7	2.3	86.2	2.8	22.8	5.5	.910
146.0-147.0	4.7	2.3	91.1	1.9	12.2	5.5	.910
147.0-148.0	5.4	2.2	90.2	2.2	14.2	5.3	.912
148.0-149.0	9.6	2.4	85.0	3.0	25.1	5.8	.917
149.0-150.0	9.3	2.3	85.5	2.9	24.4	5.5	.917
150.0-151.0	9.0	2.3	86.1	2.6	23.4	5.5	.920
151.0-152.0	7.1	2.3	87.7	2.9	18.3	5.5	.924
152.0-153.0	9.2	2.3	85.4	3.1	24.0	5.5	.921
153.0-154.0	5.0	2.4	90.1	2.5	13.1	5.8	.918
154.0-155.0	2.7	2.1	93.0	2.2	7.2	5.0	.907
155.0-156.0	2.4	2.2	93.8	1.6	6.4	5.3	.903
156.0-157.0	5.0	2.0	90.9	2.1	13.1	4.8	.908
157.0-158.0	8.8	1.9	86.8	2.5	23.2	4.6	0.913
158.0-159.0	11.6	2.1	83.1	3.2	30.3	5.0	.920
159.0-160.0	8.8	2.8	85.5	2.9	23.0	6.7	.910
160.0-161.0	7.8	2.5	87.3	2.4	20.7	6.0	.899
161.0-162.0	5.7	2.7	89.5	2.1	15.1	6.5	.903
162.0-163.0	5.0	3.0	90.5	1.5	13.6	7.2	.892
163.0-164.0	3.9	3.5	90.2	2.4	10.4	8.4	.904
164.0-165.0	3.3	2.2	92.4	2.1	8.9	5.3	.899
165.0-166.0	2.5	1.9	94.6	1.0	6.7	4.6	.891
166.0-167.0	1.2	2.9	94.9	1.0	3.2a	7.0	
167.0-168.0	1.3	2.8	94.9	1.0	3.4a	6.7	
168.0-169.0	3.4	2.8	91.3	2.5	9.1	6.7	.902
169.0-170.0	8.5	2.0	86.4	3.1	22.4	4.8	.909
170.0-171.0	6.8	2.5	88.4	2.3	18.0	6.0	.901
171.0-172.0	6.2	2.6	89.1	2.1	16.4	6.2	.902
172.0-173.0	3.6	3.2	91.3	1.9	9.8	7.7	.887
173.0-174.0	2.9	3.5	90.9	2.7	8.0	8.4	.883
174.0-175.0	3.2	3.2	92.1	1.5	8.6	7.7	.894
175.0-176.0	3.5	3.0	91.1	2.4	9.4	7.2	.891
176.0-177.0	3.6	3.7	90.7	2.0	9.6	8.9	.898
177.0-178.0	4.1	2.6	91.7	1.6	10.9	6.2	.908
178.0-179.0	1.7	2.1	95.3	.9	4.3a	5.0	
179.0-180.0	2.1	2.5	94.0	1.4	5.6	6.0	.885
180.0-181.0	1.6	2.3	94.9	1.2	4.0a	5.5	
181.0-182.0	1.4	2.3	95.3	1.0	3.6a	5.5	
182.0-183.0	1.3	2.5	95.0	1.2	3.4a	6.0	
183.0-184.0	2.2	2.5	94.0	1.3	5.8	6.0	.901
184.0-185.0	4.9	2.1	91.2	1.8	13.1	5.0	.890
185.0-186.0	6.6	2.1	88.8	2.5	17.5	5.0	.901
186.0-187.0	6.7	2.4	88.5	2.4	17.8	5.8	.897

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-5 (Continued)

Depth From–To	Yield of product: Weight percent Oil	Water	Spent shale	Gas + loss	Gal per ton Oil[1/]	Water	Specific gravity of oil at 60°/60° F
187.0–188.0	7.7	2.0	86.8	3.5	20.3	4.8	0.909
188.0–189.0	7.9	1.9	87.3	2.9	20.9	4.6	.910
189.0–190.0	5.6	2.1	90.2	2.1	14.8	5.0	.911
190.0–191.0	5.7	1.9	90.4	2.0	15.2	4.6	.908
191.0–192.0	3.4	2.2	92.5	1.9	9.0	5.3	.907
192.0–193.0	4.8	1.9	91.5	1.8	12.8	4.6	.909
193.0–194.0	8.7	2.6	86.0	2.7	23.0	6.2	.907
194.0–195.0	7.8	1.7	88.1	2.4	20.8	4.1	.904
195.0–196.0	3.5	2.1	92.7	1.7	9.2	5.0	.904
196.0–197.0	4.4	1.9	91.6	2.1	11.7	4.6	.913
197.0–198.0	5.3	1.9	90.8	2.0	13.7	4.6	.916
198.0–199.0	8.9	1.6	86.5	3.0	23.2	3.8	.919
199.0–200.0	6.1	2.2	89.7	2.0	16.2	5.3	.900
200.0–201.0	6.8	2.8	88.1	2.3	18.0	6.7	.900
201.0–202.0	6.9	2.9	87.2	3.0	18.1	7.0	.918
202.0–203.0	9.3	2.2	85.6	2.9	24.2	5.3	.921
203.0–204.0	12.9	2.2	81.4	3.5	33.2	5.3	.929
204.0–205.0	5.8	2.5	88.7	3.0	15.3	6.0	.918
205.0–206.0	2.4	2.5	92.8	2.3	6.3	6.0	.895
206.0–207.0	2.5	3.5	91.2	2.8	6.9	8.4	.884
207.0–208.0	3.2	2.7	92.2	1.9	8.5	6.5	.898
208.0–209.0	2.8	3.0	91.4	2.8	7.7	7.2	.883
209.0–210.0	4.9	3.5	89.2	2.4	13.3	8.4	.892
211.0–212.0	3.4	3.9	87.9	4.8	9.0	9.3	.893
212.0–213.0	4.0	3.8	89.0	3.2	10.8	9.0	.896
213.0–214.0	6.4	3.0	88.1	2.5	16.8	7.2	.906
214.0–215.0	7.5	1.8	87.9	2.8	19.5	4.3	.920
215.0–216.0	5.0	1.7	90.8	2.5	12.9	4.1	.925
216.0–217.0	9.6	2.0	85.5	2.9	24.9	4.8	.930
217.0–218.0	7.5	2.6	87.2	2.7	19.5	6.2	.928
218.0–219.0	6.4	2.5	88.7	2.4	16.6	6.0	0.924
219.0–220.0	4.6	2.4	90.9	2.1	11.8	5.8	.926
220.0–221.0	4.5	3.2	89.7	2.6	11.6	7.7	.925
221.0–222.0	5.1	3.4	87.7	3.8	13.2	8.1	.925
222.0–223.0	8.1	2.8	86.2	2.9	20.9	6.7	.929
223.0–224.0	4.9	2.0	90.7	2.4	12.6	4.8	.927
224.0–225.0	4.6	3.0	90.0	2.4	11.8	7.2	.921
225.0–226.0	5.5	3.2	89.1	2.2	14.6	7.7	.906
226.0–227.0	6.2	4.0	87.2	2.6	16.3	9.6	.911
227.0–228.0	8.7	2.4	85.9	3.0	22.8	5.8	.914
228.0–229.0	9.7	1.8	85.7	2.8	25.4	4.3	.916
229.0–230.0	10.6	2.2	84.2	3.0	27.6	5.3	.918
230.0–231.0	5.6	3.1	89.0	2.3	14.7	7.4	.920
231.0–232.0	4.0	3.3	90.4	2.3	10.7	7.9	.894
232.0–233.0	2.4	2.8	93.3	1.5	6.5	6.7	.879

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-5 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
233.0	234.0	1.8	3.6	91.7	2.9	4.8a	8.6	
234.0	235.0	1.6	3.5	92.7	2.2	4.1a	8.4	
235.0	236.0	3.6	2.7	91.2	2.5	9.8	6.5	.891
236.0	237.0	3.9	3.4	90.3	2.4	10.4	8.1	.904
237.0	238.0	3.4	1.5	93.6	1.5	9.1	3.6	.893
238.0	239.0	3.5	2.1	91.6	2.8	9.6	5.0	.888
239.0	240.0	2.5	2.6	92.1	2.8	6.8	6.2	.881
240.0	241.0	2.2	2.6	92.8	2.4	6.0	6.2	.875
241.0	242.0	1.9	2.7	94.1	1.3	4.9a	6.5	
242.0	243.0	1.1	3.2	94.1	1.6	3.0a	7.7	
243.0	244.0	1.2	3.2	93.9	1.7	3.3a	7.7	
244.0	245.0	3.2	2.3	93.0	1.5	8.6	5.5	.879
245.0	246.0	3.2	2.7	92.3	1.8	8.9	6.5	.880
246.0	247.0	3.6	2.7	92.2	1.5	9.8	6.5	.880
247.0	248.0	2.1	2.6	93.4	1.9	5.8	6.2	.875
248.0	249.0	2.6	2.8	92.0	2.9	6.2	6.7	0.874
249.0	250.0	4.0	3.0	91.3	1.7	10.9	7.2	.887
250.0	251.0	4.1	2.3	91.4	2.2	10.8	5.5	.903
251.0	252.0	4.4	3.0	90.5	2.1	11.8	7.2	.887
252.0	253.0	8.9	2.8	85.6	2.7	23.8	6.7	.896
253.0	254.0	7.0	2.0	89.0	2.0	18.5	4.8	.903
254.0	255.0	8.0	2.3	86.8	2.9	21.2	5.5	.905
255.0	256.0	4.5	2.9	90.9	1.7	12.1	7.0	.889
256.0	257.0	3.8	3.0	90.9	2.3	10.3	7.2	.897
257.0	258.0	7.5	2.8	87.1	2.6	20.1	6.7	.890
258.0	259.0	6.0	3.2	88.5	2.3	16.3	7.7	.886
259.0	260.0	6.5	3.2	88.0	2.3	17.3	7.7	.895
260.0	261.0	4.9	3.1	89.4	2.6	13.0	7.4	.899
261.0	262.0	5.3	2.4	90.2	2.1	14.2	5.8	.905
262.0	263.0	3.1	2.9	92.1	1.9	8.5	7.0	.883
263.0	264.0	2.1	3.5	92.8	1.6	5.8	8.4	.876
264.0	265.0	3.4	3.9	90.9	1.8	9.2	9.3	.877
265.0	266.0	3.0	1.9	93.6	1.5	8.1	4.6	.895
266.0	267.0	3.6	2.9	90.7	2.8	9.6	7.0	.902
267.0	268.0	4.5	2.8	90.4	2.3	11.7	6.7	.914
268.0	269.0	4.6	2.5	90.1	2.8	12.2	6.0	.904
269.0	270.0	2.3	3.3	91.8	2.6	6.2	7.9	.897
270.0	271.0	2.7	2.8	92.6	1.9	7.4	6.7	.891
271.0	272.0	2.6	3.4	91.8	2.2	7.2	8.1	.882
272.0	273.0	2.6	3.4	91.2	2.8	7.1	8.1	.879
273.0	274.0	3.2	3.0	91.8	2.0	8.7	7.2	.881
274.0	275.0	3.9	2.7	91.4	2.0	10.3	6.5	.894
275.0	276.0	5.6	2.2	90.0	2.2	14.6	5.3	.915
276.0	277.0	6.5	2.5	88.6	2.4	17.0	6.0	.913
277.0	278.0	6.7	2.0	88.8	2.5	17.7	4.8	.912

samples from the U.S. Geological Survey's Corehole 78-5 (Continued)

Depth From-To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
278.0-279.0	6.9	2.2	88.3	2.6	18.0	5.3	0.913
279.0-280.0	4.9	3.4	89.6	2.1	13.0	8.1	.909
280.0-281.0	4.6	3.5	88.8	3.1	12.2	8.4	.905
281.0-282.0	5.0	3.6	88.7	2.7	13.2	8.6	.904
282.0-283.0	3.5	2.8	91.8	1.9	9.4	6.7	.902
284.0-285.0	3.5	2.4	91.6	2.5	9.5	5.8	.899
285.0-286.0	3.6	2.7	91.6	2.1	9.6	6.5	.899
286.0-287.0	3.9	2.7	91.0	2.4	10.5	6.5	.896
287.0-288.0	3.4	2.6	92.3	1.7	9.0	6.2	.902
288.0-289.0	4.6	2.4	91.1	1.9	12.0	5.8	.910
289.0-290.0	8.8	2.5	85.5	3.2	23.3	6.0	.911
290.0-291.0	8.6	3.0	85.1	3.3	22.9	7.2	.904
291.0-292.0	7.0	3.0	86.6	3.4	18.7	7.2	.900
292.0-293.0	3.7	2.6	91.8	1.9	9.9	6.2	.895
293.0-294.0	3.5	2.9	90.7	2.9	9.3	7.0	.899
294.0-295.0	3.8	2.3	90.9	3.0	10.1	5.5	.893
295.0-296.0	4.0	2.7	91.2	2.1	10.8	6.5	.886
296.0-297.0	3.9	2.6	91.4	2.1	10.5	6.2	.889
297.0-298.0	4.3	2.3	91.3	2.1	11.5	5.5	.889
298.0-299.0	7.1	2.8	87.9	2.2	19.1	6.7	.895
299.0-300.0	5.1	2.6	90.0	2.3	13.6	6.2	.896
300.0-301.0	6.4	2.3	89.5	1.8	17.1	5.5	.902
301.0-302.0	4.9	3.4	89.9	1.8	13.0	8.1	.893
302.0-303.0	4.4	2.5	91.6	1.5	11.9	6.0	.894
303.0-304.0	6.8	1.9	88.8	2.5	18.1	4.6	.901
304.0-305.0	8.6	3.7	85.1	2.6	23.0	8.9	.896
305.0-306.0	7.1	2.4	87.5	3.0	18.7	5.8	.916
306.0-307.0	6.7	2.8	87.9	2.6	17.7	6.7	.912
307.0-308.0	11.6	2.1	83.7	2.6	30.3	5.0	.915
308.0-309.0	11.7	2.4	83.2	2.7	30.8	5.8	.909
309.0-310.0	10.2	2.6	84.4	2.8	26.9	6.2	0.908
310.0-311.0	9.3	2.3	85.5	2.8	24.9	5.5	.910
311.0-312.0	9.2	2.9	85.5	2.4	24.2	7.0	.907
312.0-313.0	4.6	3.2	90.2	2.0	12.3	7.7	.893
313.0-314.0	4.9	2.9	90.3	1.9	13.3	7.0	.892
314.0-315.0	5.8	2.6	89.0	2.6	15.4	6.2	.903
315.0-316.0	5.3	2.9	88.6	3.2	14.0	7.0	.905
316.0-317.0	4.3	3.4	90.1	2.2	11.4	8.1	.900
317.0-318.0	4.7	3.3	89.6	2.4	12.7	7.9	.892
318.0-319.0	3.9	2.6	91.1	2.4	10.5	6.2	.889
319.0-320.0	2.9	2.8	92.0	2.3	7.9	6.7	.889
320.0-321.0	1.9	2.9	93.5	1.7	5.0a	7.0	
321.0-322.0	2.3	2.8	92.2	2.7	6.2	6.7	.874

1/ "a"--indicates specific gravity estimated as 0.92.

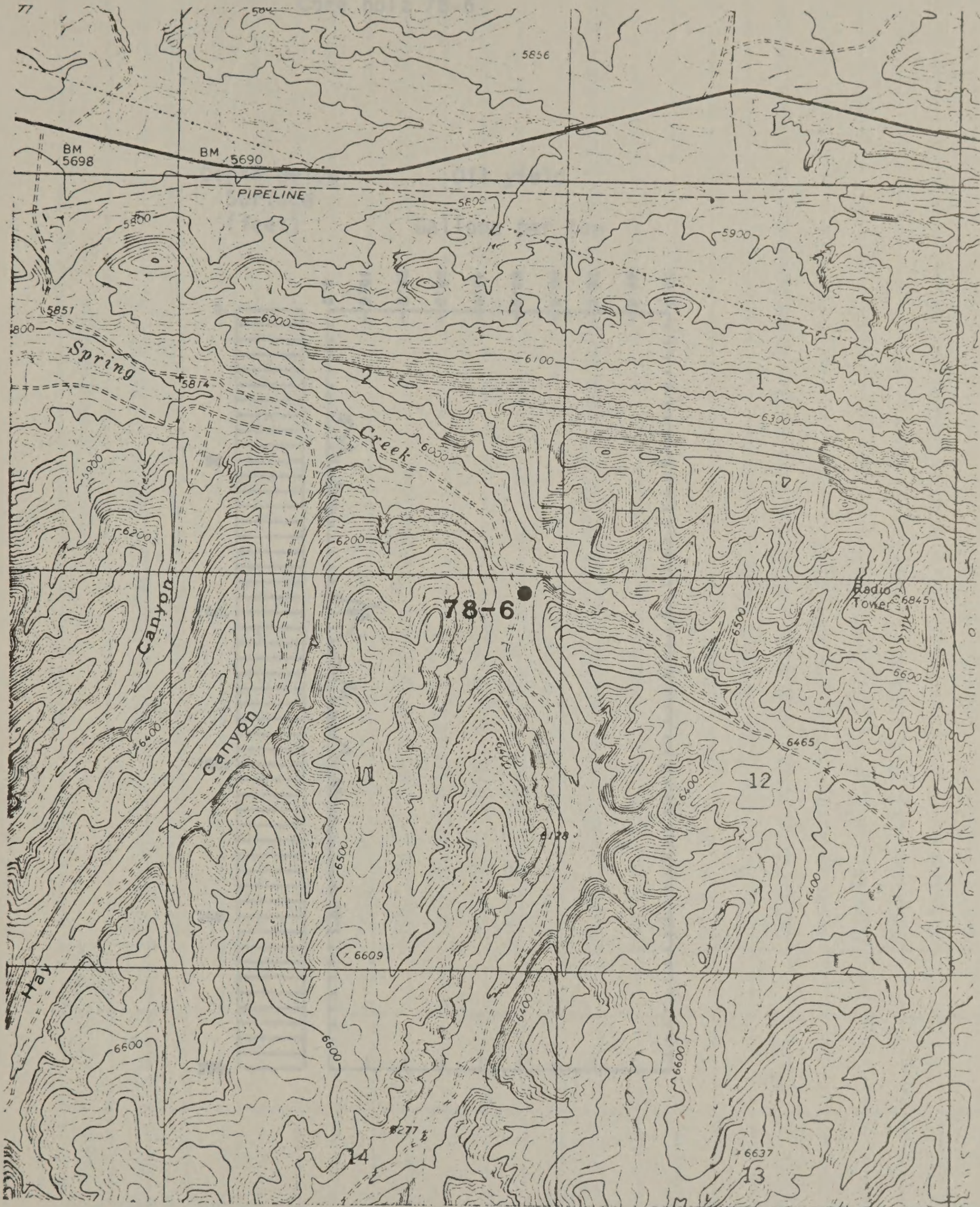
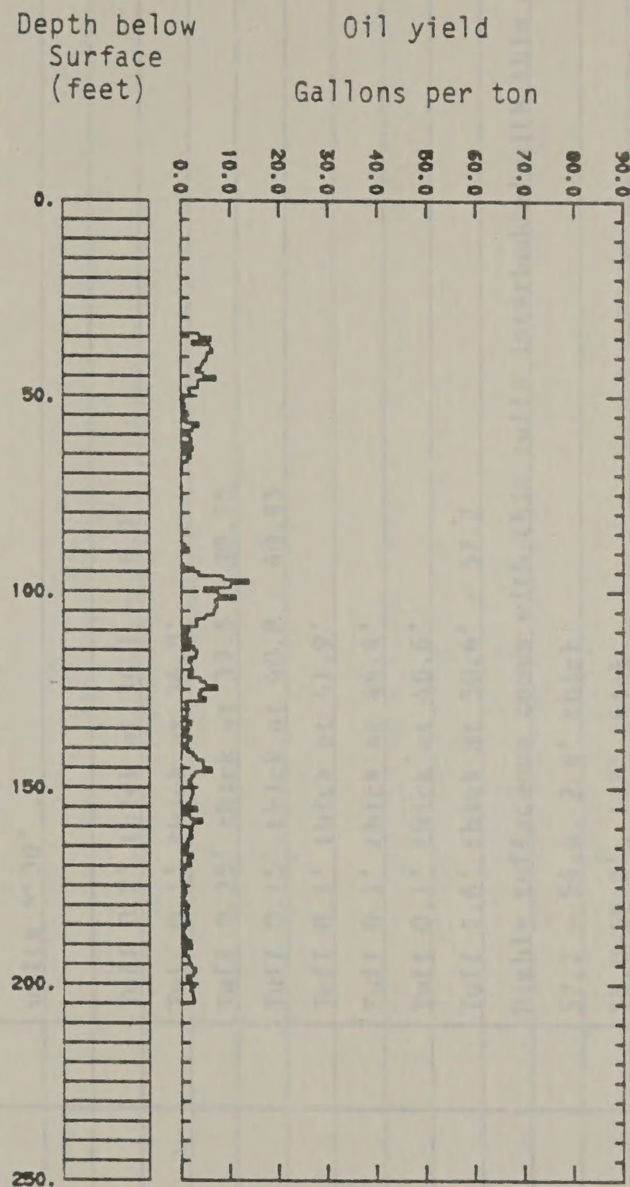


Figure 7.--Map showing location of core hole 78-6. Base from Rough Gulch Quadrangle (1966). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-6



FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
34.0	64.0		Brown to dark and gray brown oil shale interbedded
			with abundant tuff. Turbated in parts. Dip of bedding and surface rock
			units ~30° .
			Tuff 0.2' thick at 36.1 - 36.3'
			Tuff 0.1' thick at 36.8'
			Tuff 0.25' thick at 39.5 - 39.75
			Tuff 0.15' thick at 40.8 - 40.95
			Tuff 0.1' thick at 41.9'
			Tuff 0.1' thick at 44.4'
			Tuff 0.1' thick at 46.6'
			Tuff 1.6' thick at 50.6' - 52.2
			Highly tuffaceous zones with thin tuffs interbedded with thin oil shale
			52.2 - 54.6, 2.4' thick
			55.0-56.2', 1.2' thick
			58.5 - 59.1', 0.6' thick
			Tuff 0.4' thick at 54.6 - 55.0'
64.0	93.6		Tuffaceous zone with many thick to thin tuffs interbedded with brown to gray
			brown oil shale ≥60 percent tuff
			Massive tuff 0.1' thick at 69.8'
			Massive tuff 0.1' thick at 70.2'
			Massive tuff 1.1' thick at 74.5 - 75.6' minor shale
			Massive tuff 0.1' thick at 76.8
			Massive tuff 0.15' thick at 79.35 - 79.5

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Massive tuff 0.15' thick at 80.6 - 80.75
			Massive tuff 0.1' thick at 83.0
			Massive tuff 0.1' thick at 85.3
			Massive tuff 0.15' thick at 86.0-86.15'
			Massive tuff 0.1' thick at 86.4'
			Massive tuff 0.1' thick at 86.6'
			Massive tuff 0.2' thick at 89.5 - 89.7
			Massive tuff at 3.5' thick at 89.8-93.3
93.6	167.0		Brown and gray to dark brown rich oil shale with abundant interbedded and mixed tuff, thinly bedded with little turbation.
			Tuff 0.15' thick at 96.45' - 96.6'
			Tuff 0.15' thick at 107.05 - 107.2 - Blue when wet.
			Tuff 0.1' thick at 108.9'
			Tuff 0.3' thick at 121.9 - 122.2
			Tuff 0.2' thick at 134.8 - 135.0
			Tuff 0.3' thick at 136.9-137.2
			Tuff 0.7' thick at 139.2 - 139.9
			Calcite cemented breccia at 144.5'-144.8', 0.3' thick

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.15' thick at 145.5-145.65
			Highly turbated zone with local unconformities and auto-conglomerate of oil shale
			and tuff clasts in a muddy calcific matrix 156.4 to 156.9 , 0.5' thick
167.0	204.8		Highly tuffaceous with brown to gray lean oil shale interbedded with abundant
			tuff. Most tuff is off white creame to tan and light gray. May contain
			abundant silt.
			Tuff 0.1' thick at 170.0
			Tuff 0.1' thick at 170.8
			Tuff 1.4' thick at 170.9-172.3' nearly white in color - turbated at base
			Tuff 2.1' thick at 172.6 - 174.7 with minor shale
			Tuff 0.9 thick at 174.9-175.8
			Tuff 0.3 thick at 176.9-177.2
			Tuff 0.3' thick at 177.9 - 178.2
			Tuff 0.2' thick at 178.5 - 178.7
			Tuff 0.2' thick at 179.1-179.3
			Tuff 0.15' thick at 179.85-180.0
			Tuff 0.3' thick at 180.3-180.6 with minor shale
			Tuff 0.3' thick at 180.9-181.2
			Tuff 0.1' thick at 182.3
			Tuff 0.1' thick at 182.6

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			Tuff 0.3' thick at 182.0-182.3
			Tuff 0.15' thick at 185.4-185.55
			Tuff 0.1' thick at 186.0
			Tuff 0.5' thick at 188.9 -~189.4
			~0.2' lost from 189.3 - 189.5
			Tuff 0.4' thick at 191.5-191.9
			Tuff 0.4' thick at 204.8 - BOTTOM OF HOLE

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-6 drilled in sec. 11, T. 2 N., R. 99 W., Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil 1/	Water	
34.0-35.0		1.4	1.8	95.9	0.9	3.7a	4.3	
35.0-36.0		2.3	1.7	95.3	.7	6.1	4.1	0.921
36.0-37.0		.9	3.3	95.2	.6	2.3a	7.9	
37.0-38.0		2.3	2.7	94.1	.9	6.0	6.5	.921
38.0-39.0		2.5	1.6	95.2	.7	6.5	3.8	.914
39.0-40.0		2.1	1.6	95.6	.7	5.3	3.8	.919
40.0-41.0		2.0	1.5	95.7	.8	5.2	3.6	.914
41.0-42.0		1.7	1.9	95.8	.6	4.5a	4.6	
42.0-43.0		1.6	1.5	96.3	.6	4.1a	3.6	
43.0-44.0		1.2	1.0	97.1	.7	3.1a	2.4	
44.0-45.0		1.8	1.5	95.7	1.0	4.6a	3.6	
45.0-46.0		2.7	1.4	94.7	1.2	7.1	3.4	.913
46.0-47.0		1.3	1.9	96.0	.8	3.4a	4.6	
47.0-48.0		1.4	1.3	96.8	.5	3.5a	3.1	
48.0-49.0		.6	1.2	97.4	.8	1.6a	2.9	
49.0-50.0		.7	1.0	97.3	1.0	1.9a	2.4	
50.0-51.0		.2	.9	98.6	.3	.6a	2.2	
51.0-52.0		.0	.4	99.5	.1	No oil	.9	
52.0-53.0		.3	.7	98.7	.3	.8a	1.7	
53.0-54.0		.1	1.2	98.4	.3	.4a	2.9	
54.0-55.0		.5	1.3	97.6	.6	1.3a	3.1	
55.0-56.0		.1	1.0	98.5	.4	.4a	2.4	
56.0-57.0		.5	1.3	97.7	.5	1.2a	3.1	
57.0-58.0		1.4	1.3	96.8	.5	3.6a	3.1	
58.0-59.0		.9	1.3	97.3	.5	2.3a	3.1	
59.0-60.0		.2	1.1	98.2	.5	.5a	2.6	
60.0-61.0		.7	1.6	97.2	.5	1.8a	3.8	
61.0-62.0		.9	2.0	96.4	.7	2.2a	4.8	
62.0-63.0		.1	1.9	96.9	1.1	.1a	4.6	
63.0-64.0		.9	2.2	96.1	.8	2.4a	5.3	
64.0-65.0		0.1	1.4	97.8	0.7	0.2a	3.4	
65.0-66.0		.8	2.4	96.1	.7	2.0a	5.8	
66.0-67.0		.5	1.8	97.5	.2	1.3a	4.3	
67.0-68.0		.1	2.3	97.1	.5	.2a	5.5	
68.0-69.0		.0	1.9	97.7	.4	.1a	4.6	
69.0-70.0		.0	1.5	98.2	.3	Trace	3.6	
70.0-71.0		.0	1.8	97.9	.3	Trace	4.2	
71.0-72.0		.0	2.3	97.3	.4	Trace	5.5	
72.0-73.0		.0	1.3	98.2	.5	Trace	3.1	
73.0-74.0		.1	1.9	97.7	.3	.1a	4.6	
74.0-75.0		.0	2.1	97.6	.3	Trace	5.1	
75.0-76.0		.0	4.2	95.4	.4	Trace	10.1	
76.0-77.0		.0	2.2	97.3	.5	.1a	5.3	
77.0-78.0		.0	2.0	97.6	.4	Trace	4.8	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-6 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil 1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
78.0-79.0	.0	2.2	97.4	.4	Trace	5.3	
79.0-80.0	.0	1.9	97.6	.5	Trace	4.6	
80.0-81.0	.0	1.6	98.1	.3	No oil	3.9	
81.0-82.0	.0	2.1	97.4	.5	Trace	5.1	
82.0-83.0	.0	2.1	97.6	.3	Trace	5.0	
83.0-84.0	.0	1.4	98.1	.5	.1a	3.4	
84.0-85.0	.0	2.0	97.3	.7	No oil	4.7	
85.0-86.0	.1	.8	98.8	.3	.1a	1.9	
86.0-87.0	.0	.8	98.8	.4	Trace	1.9	
87.0-88.0	.1	1.0	98.5	.4	.1a	2.4	
88.0-89.0	.3	.7	98.5	.5	.8a	1.7	
89.0-90.0	.6	.5	98.5	.4	1.5a	1.2	
90.0-91.0	.0	.2	99.5	.3	No oil	.6	
91.0-92.0	.0	.2	99.5	.3	No oil	.5	
92.0-93.0	.0	.2	99.6	.2	No oil	.4	
93.0-94.0	.2	.4	99.0	.4	.5a	1.0	
94.0-95.0	1.0	0.4	98.1	0.5	2.5a	1.0	
95.0-96.0	1.4	.7	97.3	.6	3.6a	1.7	
96.0-97.0	3.3	2.7	92.6	1.4	8.6	6.5	0.909
97.0-98.0	5.2	1.9	91.2	1.7	13.7	4.6	.910
98.0-99.0	3.8	1.5	93.4	1.3	10.1	3.6	.908
99.0-100.0	1.7	1.0	96.4	.9	4.6a	2.4	
100.0-101.0	2.8	1.4	94.9	.9	7.5	3.4	.906
101.0-102.0	4.2	2.2	92.2	1.4	11.1	5.3	.913
102.0-103.0	2.6	1.7	94.8	.9	6.8	4.1	.910
103.0-104.0	2.8	1.8	94.6	.8	7.4	4.3	.911
104.0-105.0	2.6	1.4	95.3	.7	6.8	3.4	.908
105.0-106.0	2.4	1.1	95.7	.8	6.5	2.6	.903
106.0-107.0	1.8	1.1	96.3	.8	4.8a	2.6	
107.0-108.0	1.1	2.0	96.4	.5	2.9a	4.8	
108.0-109.0	1.2	1.7	96.4	.7	3.2a	4.1	
109.0-110.0	.2	.6	98.4	.8	.6a	1.4	
110.0-111.0	.5	.7	98.3	.5	1.3a	1.7	
111.0-112.0	.3	.4	98.7	.6	.7a	1.0	
112.0-113.0	.7	.8	97.9	.6	1.9a	1.9	
113.0-114.0	.3	.7	98.6	.4	.9a	1.7	
114.0-115.0	1.0	.9	97.5	.6	2.6a	2.2	
115.0-116.0	1.2	1.3	96.9	.6	3.2a	3.1	
116.0-117.0	1.1	1.1	97.3	.5	2.9a	2.6	
117.0-118.0	.6	1.0	97.9	.5	1.5a	2.4	
118.0-119.0	.8	.7	97.9	.6	2.1a	1.7	
119.0-120.0	.8	1.3	97.3	.6	2.1a	3.1	
120.0-121.0	.9	2.1	96.5	.5	2.3a	5.0	
121.0-122.0	.6	2.5	96.5	.4	1.5a	6.0	
122.0-123.0	1.5	1.4	96.6	.5	3.9a	3.4	
123.0-124.0	1.9	1.3	96.1	.7	5.0a	3.1	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-6 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
124.0-125.0	2.8	1.5	94.9	0.8	7.3	3.6	0.911
125.0-126.0	1.5	1.2	96.6	.7	3.9a	2.9	
126.0-127.0	1.4	1.2	96.9	.5	3.5a	2.9	
127.0-128.0	1.9	1.6	95.8	.7	5.0a	3.8	
128.0-129.0	.4	.8	98.4	.4	.9a	1.9	
129.0-130.0	.5	.8	98.3	.4	1.3a	1.9	
130.0-131.0	.4	.5	98.8	.3	1.1a	1.2	
131.0-132.0	.5	.3	98.8	.4	1.2a	.7	
132.0-133.0	.3	.2	98.6	.9	.7a	.5	
133.0-134.0	.8	.3	98.5	.4	2.0a	.7	
134.0-135.0	.5	.1	99.0	.4	1.2a	.2	
135.0-136.0	.5	.3	98.7	.5	1.3a	.7	
136.0-137.0	.2	.3	99.2	.3	.5a	.7	
137.0-138.0	.7	.4	98.1	.8	2.0a	1.0	
138.0-139.0	.5	.4	98.7	.4	1.3a	1.0	
139.0-140.0	.2	.4	99.0	.4	.5a	1.0	
140.0-141.0	.4	.4	98.7	.5	1.2a	1.0	
141.0-142.0	.9	.5	98.0	.6	2.4a	1.2	
142.0-143.0	1.2	.8	97.0	1.0	3.1a	1.9	
143.0-144.0	1.7	1.3	96.4	.6	4.4a	3.1	
144.0-145.0	1.7	1.1	96.5	.7	4.5a	2.6	
145.0-146.0	2.4	1.9	94.7	1.0	6.2	4.6	.923
146.0-147.0	1.0	1.3	97.2	.5	2.7a	3.1	
147.0-148.0	.8	1.4	97.0	.8	2.1a	3.4	
138.0-139.0	.6	1.5	97.3	.6	1.5a	3.6	
149.0-150.0	.8	1.4	97.1	.7	2.1a	3.4	
150.0-151.0	.8	1.5	97.2	.5	2.2a	3.6	
151.0-152.0	.9	1.7	96.9	.5	2.4a	4.1	
152.0-153.0	.8	1.5	97.1	.6	2.1a	3.6	
153.0-154.0	.7	.8	97.9	.6	1.8a	1.9	
154.0-155.0	0.4	1.0	98.0	0.6	1.2a	2.4	
155.0-156.0	1.2	1.3	96.5	1.0	3.2a	3.1	
156.0-157.0	.3	.6	98.5	.6	.7a	1.4	
157.0-158.0	.7	1.0	97.4	.9	1.8a	2.4	
158.0-159.0	1.6	1.9	95.6	.9	4.2a	4.6	
159.0-160.0	.9	1.6	96.8	.7	2.3a	3.8	
160.0-161.0	.8	1.8	96.7	.7	2.2a	4.3	
161.0-162.0	.7	1.8	96.4	1.1	1.7a	4.3	
162.0-163.0	.9	1.9	96.2	1.0	2.2a	4.6	
163.0-164.0	.5	1.8	96.9	.8	1.4a	4.3	
164.0-165.0	.4	1.7	97.0	.9	1.1a	4.1	
165.0-166.0	.4	1.4	97.4	.8	1.2a	3.4	
166.0-167.0	.2	1.2	97.8	.8	.6a	2.9	
167.0-168.0	.9	1.4	97.0	.7	2.3a	3.4	
168.0-169.0	.5	.9	98.0	.6	1.3a	2.2	
169.0-170.0	.7	.7	98.0	.6	1.9a	1.7	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-6 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
170.0-171.0	.3	.4	98.9	.4	.8a	1.0	
171.0-172.0	.0	.2	99.6	.2	Trace	.4	
172.0-173.0	.1	.2	99.5	.2	.3a	.5	
173.0-174.0	.0	.2	99.4	.4	Trace	.4	
174.0-175.0	.2	.2	99.4	.2	.5a	.5	
175.0-176.0	.3	.2	99.2	.3	.7a	.5	
176.0-177.0	.4	.4	98.9	.3	1.0a	1.0	
177.0-178.0	.3	.4	98.9	.4	.7a	1.0	
178.0-179.0	.1	.2	99.0	.7	.4a	.5	
179.0-180.0	.4	.6	98.6	.4	1.0a	1.4	
180.0-181.0	.6	.3	98.8	.3	1.4a	.7	
181.0-182.0	.3	.4	98.8	.5	.9a	1.0	
182.0-183.0	.5	.4	98.6	.5	1.3a	1.0	
183.0-184.0	.4	.4	98.7	.5	1.1a	1.0	
184.0-185.0	0.6	0.3	98.6	0.5	1.5a	0.7	
185.0-186.0	.3	.2	99.1	.4	.8a	.5	
186.0-187.0	.1	.4	99.1	.4	.3a	1.0	
187.0-188.0	.2	.3	99.1	.4	.5a	.7	
188.0-189.0	.4	.4	98.6	.6	1.0a	1.0	
189.0-190.0	.7	.8	98.1	.4	1.9a	1.9	
190.0-191.0	.8	.6	98.1	.5	2.1a	1.4	
191.0-192.0	.2	.4	98.8	.6	.6a	1.0	
192.0-193.0	.3	.7	98.4	.6	.9a	1.7	
193.0-194.0	.6	.9	98.0	.5	1.5a	2.2	
194.0-195.0	.6	.8	98.1	.5	1.6a	1.9	
195.0-196.0	.8	.9	97.7	.6	2.1a	2.2	
196.0-197.0	1.1	1.3	97.0	.6	2.9a	3.1	
197.0-198.0	.9	1.3	97.2	.6	2.4a	3.1	
198.0-199.0	.4	1.2	97.6	.8	1.1a	2.9	
199.0-200.0	.7	1.7	97.0	.6	1.9a	4.1	
200.0-201.0	1.0	2.4	95.1	1.5	2.6a	5.8	
201.0-202.0	.7	1.0	97.4	.9	1.8a	2.4	
202.0-203.0	.9	2.3	95.7	1.1	2.3a	5.5	
203.0-204.0	.9	1.7	95.8	1.6	2.4a	4.1	
204.0-204.95	1.0	3.6	94.7	.7	2.6a	8.6	

1/ "a"--indicates specific gravity estimated as 0.92.

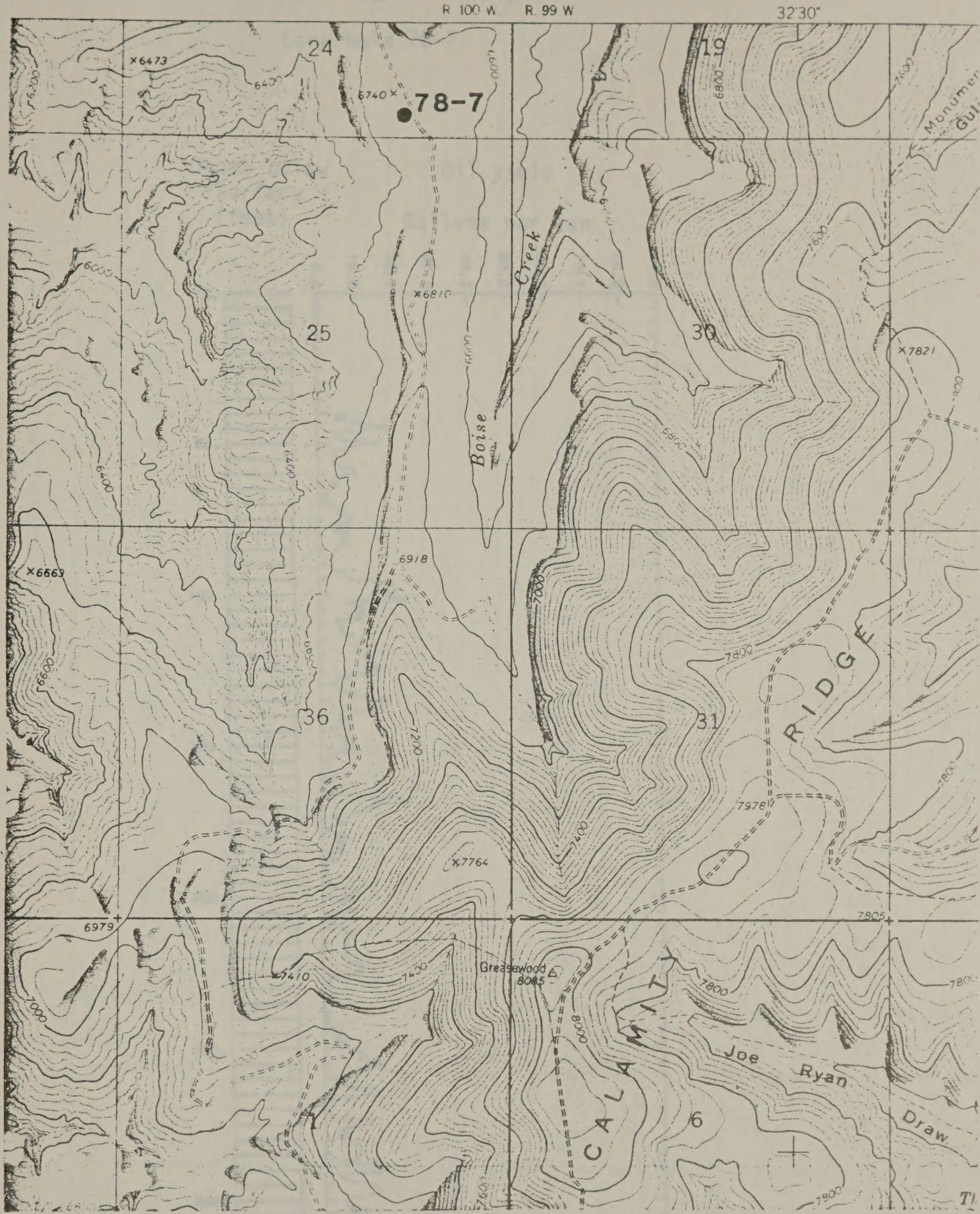
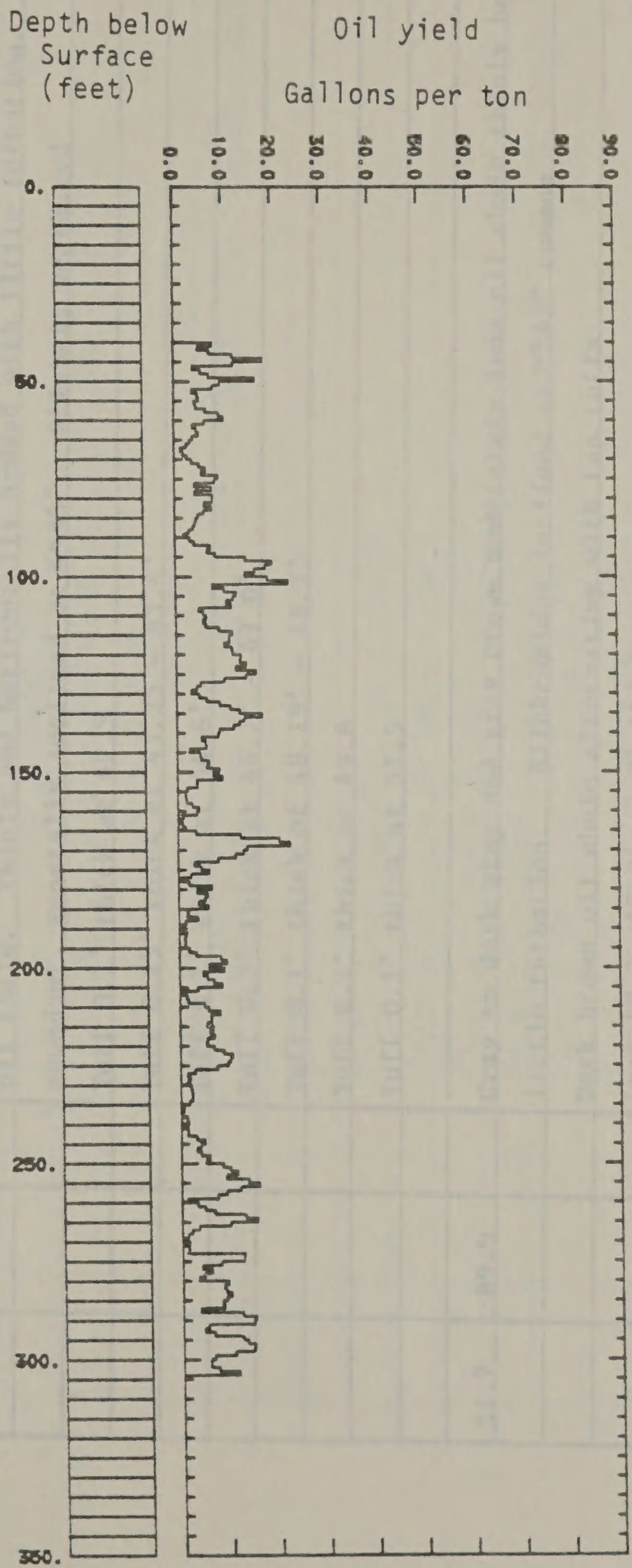


Figure 8.--Map showing location of core hole 78-7. Base from Calamity Ridge Quadrangle (1962). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-7



Corehole 78-7

Logged by Kurt Hollocher

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
40.0	51.7		Dark gray brown to brown rich oil shale alternating with tuffs and gray lean
			oil shale. Thinly and horizontally bedded with little turbation. Slickensides
			abundant, generally inclined at ~45°. Slightly weathered
			Tuff 0.1' thick at 42.5
			Tuff 0.15' thick at 43.25 - 43.4'
			Tuff 0.1' thick at 44.6'
			Tuff 0.3' thick at 46.7' - 47.0'
			Tuff 0.1' thick at 48.15' - 48.3'
			Tuff 0.1' thick at 49.8
			Tuff 0.1' thick at 51.5
51.7	89.9		Gray to dark gray and gray brown moderately lean oil shale thinly bedded with
			little turbation. Slickensides inclined at ~45° common
			Dark brown oil shale alternating with tan tuffs
			from 58.2- 60.2', 2.0' thick
			Tuff 0.1' thick at 60.0'
			Interval 65.0-68.2' highly shattered, probable core loss ~1.2'
			Dark brown rich oil shale alternating with tan tuffs
			from 73.1 - 83.5, 10.4' thick

Corehole 78-7 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.1' thick at 75.3'
			Tuff 0.2' thick at 76.6 - 76.8'
			Tuff 0.1' thick at 78.4'
			Tuff 0.15' thick at 80.85'-81.0'
			Tuff 0.2' thick at 83.9-84.1
89.9	226.5		Dark gray brown and dark brown rich oil shale, thinly bedded with tuffs.
			Tuff 0.15' thick at 106.1-106.25
			Tuff 0.2' thick at 106.6 - 106.8
			Tuff 0.2' thick at 109.0-109.2
			Tuff 0.1' thick at 111.1-111.2
			Tuff 0.2' thick at 112.8-113.0
			112.0' - 112.8' highly fractured
			116.1-118.8 tuffaceous zone with abundant intermixed tan tuff
			Tuff 0.1' thick at 125.6
			Tuff 0.2' thick at 129.5-129.7
			Tuff 0.15' thick at 133.7-133.85
			Tuff 0.15' thick at 140.5-140.65
			Tuff 0.1' thick at 144.5'
			Tuff 0.2' thick at 145.0-145.2
			Tuff 0.2' thick at 148.3 - 148.5

Corehole 78-7 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Turbated tuff 0.15' thick at 162.05 - 162.2'
			Gray lean oil shale from ~158.0 to 166.0' ~8' thick
			Tuff 0.2' thick at 167.9-168.1
			Gray lean oil shale ~173.0 - 179.1, 6.1' thick
			Gray lean oil shale 185.0-196.8, 11.8' thick
			Tuff 0.1' thick at 200.0
			Gray lean oil shale 205.8-229.5, 3.7' thick
			Tuff 0.1' thick at 224.7
226.5	256.8		Gray to dark brownish-gray lean oil shale with interbedded tuff. Thinly bedded with little turbation. Fractures and slickensides with and without breccias common
			Tuff 0.15' thick at 227.4-227.55
			Tuff 0.2' thick at 233.5 - 233.7
			Tuffaceous zone with thin tuffs interbedded with thin gray to brownish-gray oil shale 240.2 - 241.1', 0.9' thick
			Soluble salts 0.15' thick at 254.85 - 255.0

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
256.8	273.1		Abundant intermixed and layered tuff with oil shale
			259.4-262.3', 2.9' thick
			Tuff 0.2' thick at 259.4-259.6
			Gray oil shale with tuff
			Abundant interlayered tuff
			Tuff 0.1' thick at 269.5
			Tuff 0.5' thick at 270.4-270.9
273.1	304.0		Rich dark brown oil shale with some gray brown leaner oil shale.
			Thinly and evenly bedded with little turbation
			Tuff 0.1' thick at 285.0
			Tuff 0.1' thick at 287.8
			Tuff 0.1' thick at 291.6
			Tuff 0.1' thick at 295.4
			Tuff 0.15 thick at 298.3-298.45
			Tuff 0.15' thick at 299.2-299.35
			Tuff 0.1' thick at 301.6
			Comments: Post consolidation faults, slickensides, and brecciated zones very
			common. Fault planes often undulatory, but most between 30° and 60° from
			horizontal. Most slickensides have movement striations parallel to dip, rarely
			with lineations in other directions. Movement sense rarely discernable, but

Corehole 78-7 (Continued)

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			both normal and reverse motions were seen. The rock was difficult to core due to its being tough but soft. The rock is rich in clay, and has a greasy feel when wet.

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-7 drilled in sec. 24, T. 2 N., R. 100 W. Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
40.0-41.0		3.0	4.0	92.0	1.0	7.9	9.6	0.914
41.0-42.0		1.9	4.5	92.4	1.2	5.0a	10.8	
42.0-43.0		2.7	3.9	92.4	1.0	7.3	9.3	.900
43.0-44.0		4.7	3.6	90.6	1.1	12.1	8.6	.923
44.0-45.0		7.0	3.3	87.4	2.3	18.2	7.9	.919
45.0-46.0		4.6	5.0	88.8	1.6	12.2	2.0	.908
46.0-47.0		1.5	2.0	95.8	.7	3.9a	4.8	
47.0-48.0		2.0	2.8	93.4	1.8	5.5	6.7	.890
48.0-49.0		2.7	3.8	92.6	.9	7.2	9.1	.898
49.0-50.0		6.3	4.4	87.1	2.2	16.6	10.5	.913
50.0-51.0		3.6	4.2	90.1	2.1	9.4	10.1	.915
51.0-52.0		3.0	4.0	91.4	1.6	7.9	9.6	.922
52.0-53.0		1.4	4.0	93.5	1.1	3.7a	9.6	
53.0-54.0		1.8	3.6	93.4	1.2	4.8a	8.6	
54.0-55.0		1.9	3.8	93.2	1.1	5.1a	9.1	
55.0-56.0		1.6	5.0	92.1	1.3	4.2a	12.0	
56.0-57.0		1.7	5.0	92.1	1.2	4.5a	12.0	
57.0-58.0		2.4	4.4	91.6	1.6	6.5	10.5	.893
58.0-59.0		3.5	3.8	90.4	2.3	9.2	9.1	.908
59.0-60.0		3.8	3.8	90.9	1.5	10.1	9.1	.908
60.0-61.0		2.3	3.6	92.5	1.6	6.2	8.6	.900
61.0-62.0		1.5	4.5	92.6	1.4	3.8a	10.8	
62.0-63.0		1.7	4.5	91.9	1.9	4.5a	10.8	
63.0-64.0		1.9	3.5	93.1	1.5	5.0a	8.4	
64.0-65.0		1.5	4.2	93.3	1.0	3.8a	10.1	
66.0-67.0		1.0	4.0	93.8	1.2	2.5a	9.6	
67.0-68.0		.5	2.9	95.7	.9	1.3a	7.0	
68.0-69.0		.7	2.6	95.1	1.6	1.8a	6.2	
69.0-70.0		1.0	4.5	93.0	1.5	2.7a	10.8	
70.0-71.0		1.4	4.0	93.0	1.6	3.6a	9.6	
71.0-72.0		1.9	3.8	92.8	1.5	5.1a	9.1	
72.0-73.0		2.5	3.7	92.3	1.5	6.4	8.9	0.918
73.0-74.0		2.1	2.7	93.9	1.3	5.6	6.5	.911
74.0-75.0		3.4	3.4	91.3	1.9	8.9	8.1	.921
75.0-76.0		3.1	3.2	91.5	2.2	8.2	7.7	.925
76.0-77.0		1.6	2.3	95.5	.6	4.1a	5.5	
77.0-78.0		2.9	3.5	92.4	1.2	7.6	8.4	.919
78.0-79.0		1.6	2.5	93.9	2.0	4.2a	6.0	
79.0-80.0		3.0	3.7	92.2	1.1	7.8	8.9	.907
80.0-81.0		2.9	2.8	93.3	1.0	7.8	6.7	.903
81.0-82.0		2.3	2.5	94.3	.9	6.0	6.0	.906
82.0-83.0		2.8	3.8	92.2	1.2	7.5	9.1	.901
83.0-84.0		2.2	3.2	93.5	1.1	5.9	7.7	.891
84.0-85.0		1.8	2.3	94.9	1.0	4.7a	5.5	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-7 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
85.0	86.0	1.7	2.6	94.9	.8	4.3a	6.2	
86.0	87.0	1.6	3.5	93.8	1.1	4.1a	8.4	
87.0	88.0	1.4	2.8	94.0	1.8	3.7a	6.7	
88.0	89.0	1.1	3.1	94.7	1.1	2.8a	7.4	
89.0	90.0	.7	3.4	95.0	.9	1.8a	8.1	
90.0	91.0	1.1	3.4	94.0	1.5	3.0a	8.1	
91.0	92.0	1.5	3.5	93.9	1.1	3.9a	8.4	
92.0	93.0	2.7	3.2	92.9	1.2	7.2	7.7	.906
93.0	94.0	2.4	3.2	92.4	2.0	6.5	7.7	.908
94.0	95.0	3.1	3.3	92.0	1.6	8.2	7.9	.908
95.0	96.0	5.6	3.5	88.6	2.3	14.4	8.4	.921
96.0	97.0	7.6	2.9	87.3	2.2	19.8	7.0	.920
97.0	98.0	6.9	3.5	87.3	2.3	18.4	8.4	.907
98.0	99.0	6.1	4.4	87.2	2.3	16.2	10.5	.906
99.0	100.0	5.4	4.6	87.3	2.7	14.2	11.0	.919
100.0	101.0	7.1	3.5	86.6	2.8	18.8	8.4	.907
101.0	102.0	8.7	3.7	84.9	2.7	23.0	8.9	0.906
102.0	103.0	2.9	3.9	90.8	2.4	7.5	9.3	.911
103.0	104.0	3.8	3.4	91.3	1.5	9.9	8.1	.918
104.0	105.0	4.7	3.4	89.9	2.0	12.4	8.1	.919
105.0	106.0	4.5	4.4	89.1	2.0	11.7	10.5	.916
106.0	107.0	4.0	2.9	91.8	1.3	10.4	7.0	.915
107.0	108.0	4.4	3.8	90.2	1.6	11.3	9.1	.925
108.0	109.0	1.8	2.0	95.6	.6	4.7a	4.8	
109.0	110.0	2.1	2.7	94.4	.8	5.6	6.5	.892
110.0	111.0	2.3	3.8	92.7	1.2	6.2	9.1	.881
111.0	112.0	2.1	3.7	92.7	1.5	5.6	8.9	.879
112.0	113.0	2.2	3.1	93.6	1.1	6.1	7.4	.877
113.0	114.0	3.2	3.8	91.7	1.3	8.8	9.1	.884
114.0	115.0	4.3	3.7	90.2	1.8	11.5	8.9	.893
115.0	116.0	4.0	3.5	91.0	1.5	10.8	8.4	.897
116.0	117.0	4.1	2.6	91.3	2.0	10.9	6.2	.894
117.0	118.0	3.7	2.7	92.2	1.4	9.9	6.5	.896
118.0	119.0	4.3	2.3	92.0	1.4	11.4	5.5	.905
119.0	120.0	4.3	4.5	89.3	1.9	11.6	10.8	.898
120.0	121.0	4.9	3.9	89.1	2.1	13.2	9.3	.898
121.0	122.0	4.9	3.7	89.5	1.9	13.0	8.9	.897
122.0	123.0	5.4	4.6	87.8	2.2	14.3	11.0	.904
123.0	124.0	4.6	4.0	88.6	2.8	12.2	9.6	.897
124.0	125.0	6.1	2.7	90.1	1.1	16.3	6.5	.895
125.0	126.0	5.4	3.1	89.4	2.1	14.3	7.4	.895
126.0	127.0	3.6	3.2	90.5	2.7	9.8	7.7	.885
127.0	128.0	1.9	4.0	92.6	1.5	4.9a	9.6	
128.0	129.0	1.6	3.3	94.0	1.1	4.1a	7.9	
129.0	130.0	1.2	2.7	95.2	.9	3.0a	6.5	
130.0	131.0	1.8	3.8	92.6	1.8	4.6a	9.1	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-7 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
131.0-132.0	2.3	3.9	91.6	2.2	6.1	9.3	0.895
132.0-133.0	3.3	3.5	91.7	1.5	8.8	8.4	.901
133.0-134.0	4.2	2.6	91.9	1.3	11.0	6.2	.907
134.0-135.0	4.9	3.3	90.1	1.7	12.9	7.9	.911
135.0-136.0	6.6	3.4	86.9	3.1	17.4	8.1	.911
136.0-137.0	5.2	3.8	88.9	2.1	13.8	9.1	.902
137.0-138.0	4.8	3.9	89.3	2.0	12.8	9.3	.898
138.0-139.0	4.4	4.0	88.9	2.7	11.6	9.6	.904
139.0-140.0	3.3	3.8	90.7	2.2	8.7	9.1	.901
140.0-141.0	3.2	3.0	91.8	2.0	8.4	7.2	.901
141.0-142.0	1.9	3.8	92.1	2.2	5.0a	9.1	
142.0-143.0	2.1	3.8	92.0	2.1	5.8	9.1	.884
143.0-144.0	2.2	4.2	91.4	2.2	6.0	10.1	.893
144.0-145.0	1.0	2.9	94.0	2.1	2.6a	7.0	
145.0-146.0	1.8	3.7	92.6	1.9	4.7a	8.9	
146.0-147.0	1.9	3.6	92.0	2.5	4.9a	8.6	
147.0-148.0	2.5	4.5	90.2	2.8	6.5	10.8	.921
148.0-149.0	2.4	5.3	90.9	1.4	6.1	12.7	.925
149.0-150.0	3.3	3.5	91.3	1.9	8.6	8.4	.921
150.0-151.0	2.8	3.3	91.4	2.5	7.3	7.9	.918
151.0-152.0	3.5	3.3	91.4	1.8	9.2	7.9	.912
152.0-153.0	1.5	4.0	93.1	1.4	3.9a	9.6	
153.0-154.0	1.6	3.7	93.2	1.5	4.1a	8.9	
154.0-155.0	.7	4.2	93.6	1.5	1.9a	10.1	
155.0-156.0	.6	4.4	92.6	2.4	1.5a	10.5	
156.0-157.0	.6	4.6	92.8	2.0	1.7a	11.0	
157.0-158.0	.7	4.0	93.3	2.0	1.8a	9.6	
158.0-159.0	1.2	4.0	92.9	1.9	3.0a	9.6	
159.0-160.0	1.7	4.1	92.1	2.1	4.3a	9.8	
160.0-161.0	1.5	3.9	93.4	1.2	3.9a	9.3	
161.0-162.0	0.4	2.5	95.3	1.8	1.1a	6.0	
162.0-163.0	.3	2.9	95.8	1.0	.7a	7.0	
163.0-164.0	.4	3.7	94.6	1.3	1.0a	8.9	
164.0-165.0	.6	2.9	94.4	2.1	1.5a	7.0	
165.0-166.0	1.4	3.8	93.1	1.7	3.7a	9.1	
166.0-167.0	5.0	3.7	89.2	2.1	12.9	8.9	0.928
167.0-168.0	8.0	3.9	85.5	2.6	20.8	9.3	.921
168.0-169.0	8.7	3.7	85.1	2.5	22.9	8.9	.914
169.0-170.0	5.4	3.6	89.4	1.6	14.1	8.6	.920
170.0-171.0	5.1	4.5	88.7	1.6	13.3	10.8	.930
171.0-172.0	4.5	3.8	89.3	2.4	11.7	9.1	.924
172.0-173.0	3.0	4.0	91.8	1.2	8.2	9.6	.890
173.0-174.0	1.2	4.2	93.2	1.4	3.3a	10.1	
174.0-175.0	1.7	3.7	91.9	2.7	4.7	8.9	.881

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-7 (Continued)

Depth From-To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
175.0-176.0	2.3	4.7	91.0	2.0	6.3	11.3	.878
176.0-177.0	1.0	3.4	94.4	1.2	2.6a	8.1	
177.0-178.0	.3	2.8	95.8	1.1	.8a	6.7	
178.0-179.0	.8	3.1	94.5	1.6	2.2a	7.4	
179.0-180.0	2.5	4.4	90.6	2.5	6.8	10.5	.881
180.0-181.0	1.5	4.4	91.8	2.3	3.8a	10.5	
181.0-182.0	2.1	4.6	91.3	2.0	5.9	11.0	.873
182.0-183.0	2.0	4.1	91.3	2.6	5.4	9.8	.869
183.0-184.0	1.6	4.6	90.6	3.2	4.1a	11.0	
184.0-185.0	2.2	4.5	91.3	2.0	6.0	10.8	.865
185.0-186.0	.8	3.7	93.8	1.7	2.0a	8.9	
186.0-187.0	.6	3.7	93.4	2.3	1.7a	8.9	
187.0-188.0	1.5	4.2	92.1	2.2	3.9a	10.1	
188.0-189.0	.5	3.5	94.3	1.7	1.4a	8.4	
189.0-190.0	.3	3.5	94.8	1.4	.8a	8.4	
190.0-191.0	.2	3.3	95.0	1.5	.6a	7.9	
191.0-192.0	0.6	2.8	94.6	2.0	1.5a	6.7	
192.0-193.0	.5	2.9	94.6	2.0	1.2a	7.0	
193.0-194.0	.5	2.4	96.2	.9	1.3a	5.8	
194.0-195.0	.5	3.4	94.7	1.4	1.2a	8.1	
195.0-196.0	.8	3.1	94.5	1.6	2.1a	7.4	
196.0-197.0	1.3	3.4	93.1	2.2	3.5a	8.1	
197.0-198.0	3.3	3.8	90.8	2.1	8.6	9.1	0.910
198.0-199.0	3.8	3.7	90.3	2.2	9.8	8.9	.922
199.0-200.0	2.3	4.5	91.8	1.4	6.1	10.8	.896
200.0-201.0	3.5	3.4	91.0	2.1	9.2	8.1	.913
201.0-202.0	1.8	3.6	93.0	1.6	4.8a	8.6	
202.0-203.0	2.1	3.5	92.6	1.8	5.8	8.4	.883
203.0-204.0	2.6	3.9	91.2	2.3	7.1	9.3	.895
204.0-205.0	3.3	4.5	89.9	2.3	8.7	10.8	.897
205.0-206.0	1.4	3.2	94.4	1.0	3.7a	7.7	
206.0-207.0	.3	2.5	96.4	.8	.7a	6.0	
207.0-208.0	.5	2.2	96.1	1.2	1.4a	5.3	
208.0-209.0	.6	2.5	95.2	1.7	1.7a	6.0	
209.0-210.0	1.9	3.2	91.7	3.2	5.0a	7.7	
210.0-211.0	2.2	3.2	92.7	1.9	5.9	7.7	.889
211.0-212.0	3.1	3.3	91.5	2.1	8.2	7.9	.898
212.0-213.0	2.4	3.5	92.2	1.9	6.4	8.4	.891
213.0-214.0	2.4	3.4	92.1	2.1	6.5	8.1	.893
214.0-215.0	2.0	3.3	92.8	1.9	5.5	7.9	.893
215.0-216.0	2.5	2.7	93.3	1.5	6.8	6.5	.890
216.0-217.0	2.3	2.6	93.1	2.0	6.2	6.2	.888
217.0-218.0	2.6	3.0	92.6	1.8	7.0	7.2	.891
218.0-219.0	2.0	2.7	94.2	1.1	5.5	6.5	.881
219.0-220.0	2.0	2.7	93.4	1.9	5.4	6.5	.881
220.0-221.0	2.5	2.5	93.7	1.3	6.9	6.0	.882

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-7 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
221.0	222.0	3.3	2.7	92.6	1.4	8.9	6.5	0.889
222.0	223.0	4.0	3.1	90.5	2.4	10.7	7.4	.894
223.0	224.0	3.8	3.2	90.2	2.8	10.3	7.7	.897
224.0	225.0	3.7	3.3	90.8	2.2	9.8	7.9	.896
225.0	226.0	2.8	3.9	91.2	2.1	7.6	9.3	.893
226.0	227.0	1.1	3.9	93.4	1.6	3.0a	9.3	
227.0	228.0	.5	2.5	95.8	1.2	1.4a	6.0	
228.0	229.0	.7	3.5	93.2	2.6	1.9a	8.4	
229.0	230.0	.5	2.7	95.2	1.6	1.3a	6.5	
230.0	231.0	.8	3.0	94.3	1.9	2.1a	7.2	
231.0	232.0	.9	3.2	94.1	1.8	2.3a	7.7	
232.0	233.0	.9	2.8	94.6	1.7	2.4a	6.7	
233.0	234.0	.9	2.6	95.4	1.1	2.4a	6.2	
234.0	235.0	.7	2.7	95.5	1.1	1.8a	6.5	
235.0	236.0	.2	2.2	96.1	1.5	.5a	5.3	
236.0	237.0	.2	2.2	96.7	.9	.5a	5.3	
237.0	238.0	.2	2.3	96.6	.9	.4a	5.5	
238.0	239.0	.5	2.2	96.0	1.3	1.3a	5.3	
239.0	240.0	.5	1.9	96.2	1.4	1.4a	4.6	
240.0	241.0	.2	1.4	97.1	1.3	.6a	3.4	
241.0	242.0	.5	2.1	95.9	1.5	1.4a	5.0	
242.0	243.0	.6	2.3	95.4	1.7	1.4a	5.5	
243.0	244.0	1.2	2.9	93.9	2.0	3.2a	7.0	
244.0	245.0	1.9	3.7	91.6	2.8	4.8a	8.9	
245.0	246.0	1.6	3.4	93.5	1.5	4.0a	8.1	
246.0	247.0	1.2	3.2	93.9	1.7	3.2a	7.7	
247.0	248.0	1.6	3.1	93.2	2.1	4.1a	7.4	
248.0	249.0	2.2	2.7	93.6	1.5	5.8	6.5	.896
249.0	250.0	1.9	2.6	93.4	2.1	5.1a	6.2	
250.0	251.0	3.2	3.0	91.8	2.0	8.6	7.2	.898
251.0	252.0	3.8	2.8	90.7	2.7	10.1	6.7	0.897
252.0	253.0	4.3	3.1	90.4	2.2	11.5	7.4	.886
253.0	254.0	3.5	3.3	91.3	1.9	9.3	7.9	.896
254.0	255.0	5.2	2.8	90.2	1.8	13.8	6.7	.900
255.0	256.0	6.1	2.8	89.5	1.6	15.9	6.7	.911
256.0	257.0	4.6	3.2	89.5	2.7	12.1	7.7	.915
257.0	258.0	3.4	3.2	91.6	1.8	9.3	7.7	.884
258.0	259.0	2.7	3.8	91.8	1.7	7.4	9.1	.881
259.0	260.0	.5	1.6	95.8	2.1	1.2a	3.8	
260.0	261.0	1.3	2.9	94.3	1.5	3.3a	7.0	
261.0	262.0	1.9	3.1	93.4	1.6	4.8a	7.4	
262.0	263.0	2.6	3.5	92.0	1.9	6.8	8.4	.911
263.0	264.0	5.0	3.6	89.3	2.1	13.1	8.6	.919
264.0	265.0	6.0	3.7	87.8	2.5	15.5	8.9	.927

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-7 (Continued)

Depth From To	Yield of product: Weight percent Oil	Water	Spent shale	Gas + loss	Gal per ton Oil[1]	Water	Specific gravity of oil at 60°/60° F
265.0-266.0	3.8	4.0	90.2	2.0	10.0	9.6	.905
266.0-267.0	1.3	4.0	93.2	1.5	3.5a	9.6	
267.0-268.0	.8	3.7	94.0	1.5	2.0a	8.9	
268.0-269.0	.5	3.0	94.6	1.9	1.3a	7.2	
269.0-270.0	.3	1.8	97.1	.8	.7a	4.3	
270.0-271.0	.1	1.2	98.0	.7	.3a	2.9	
271.0-272.0	.5	2.6	95.3	1.6	1.4a	6.2	
272.0-273.0	.5	1.8	95.9	1.8	1.2a	4.3	
273.0-274.0	4.9	3.3	90.0	1.8	12.8	7.9	.914
274.0-275.0	4.8	3.4	89.7	2.1	12.6	8.1	.910
275.0-276.0	2.9	3.0	92.9	1.2	8.0	7.2	.882
276.0-277.0	1.5	2.9	94.4	1.2	4.0a	7.0	
277.0-278.0	2.2	3.4	92.1	2.3	6.0	8.1	.880
278.0-279.0	1.7	3.2	93.5	1.6	4.5a	7.7	
279.0-280.0	1.3	3.3	93.6	1.8	3.4a	7.9	
280.0-281.0	3.5	3.9	90.4	2.2	9.4	9.3	.892
281.0-282.0	3.2	3.8	91.2	1.8	8.6	9.1	0.897
282.0-283.0	3.4	3.4	90.8	2.4	8.9	8.1	.921
283.0-284.0	3.8	3.5	90.8	1.9	10.0	8.4	.922
284.0-285.0	3.5	4.0	90.9	1.6	9.1	9.6	.916
285.0-286.0	3.0	3.1	92.0	1.9	8.1	7.4	.897
286.0-287.0	3.2	3.8	90.0	3.0	8.5	9.1	.892
287.0-288.0	1.4	3.5	93.9	1.2	3.6a	8.4	
288.0-289.0	4.7	3.2	90.5	1.6	12.3	7.7	.920
289.0-290.0	5.7	3.7	88.4	2.2	14.9	8.9	.919
290.0-291.0	5.5	3.6	88.6	2.3	14.6	8.6	.899
291.0-292.0	2.0	3.2	92.9	1.9	5.2	7.7	.906
292.0-293.0	1.7	3.8	93.1	1.4	4.4a	9.1	
293.0-294.0	2.4	3.9	91.6	2.1	6.4	9.3	.915
294.0-295.0	4.7	3.4	89.8	2.1	12.3	8.1	.911
295.0-296.0	5.0	2.9	90.1	2.0	13.2	7.0	.904
296.0-297.0	5.5	3.5	88.8	2.2	14.7	8.4	.898
297.0-298.0	5.4	3.5	89.5	1.6	14.5	8.4	.899
298.0-299.0	4.0	2.7	90.8	2.5	10.7	6.5	.907
299.0-300.0	2.4	3.2	93.0	1.4	6.4	7.7	.897
300.0-301.0	2.1	3.5	92.9	1.5	5.6	8.4	.889
301.0-302.0	2.1	2.0	93.8	2.1	5.6	4.8	.907
302.0-303.0	2.8	3.6	91.9	1.7	7.3	8.6	.903
303.0-304.0	4.4	3.0	91.2	1.4	11.4	7.2	.921

1/ "a"--indicates specific gravity estimated as 0.92.

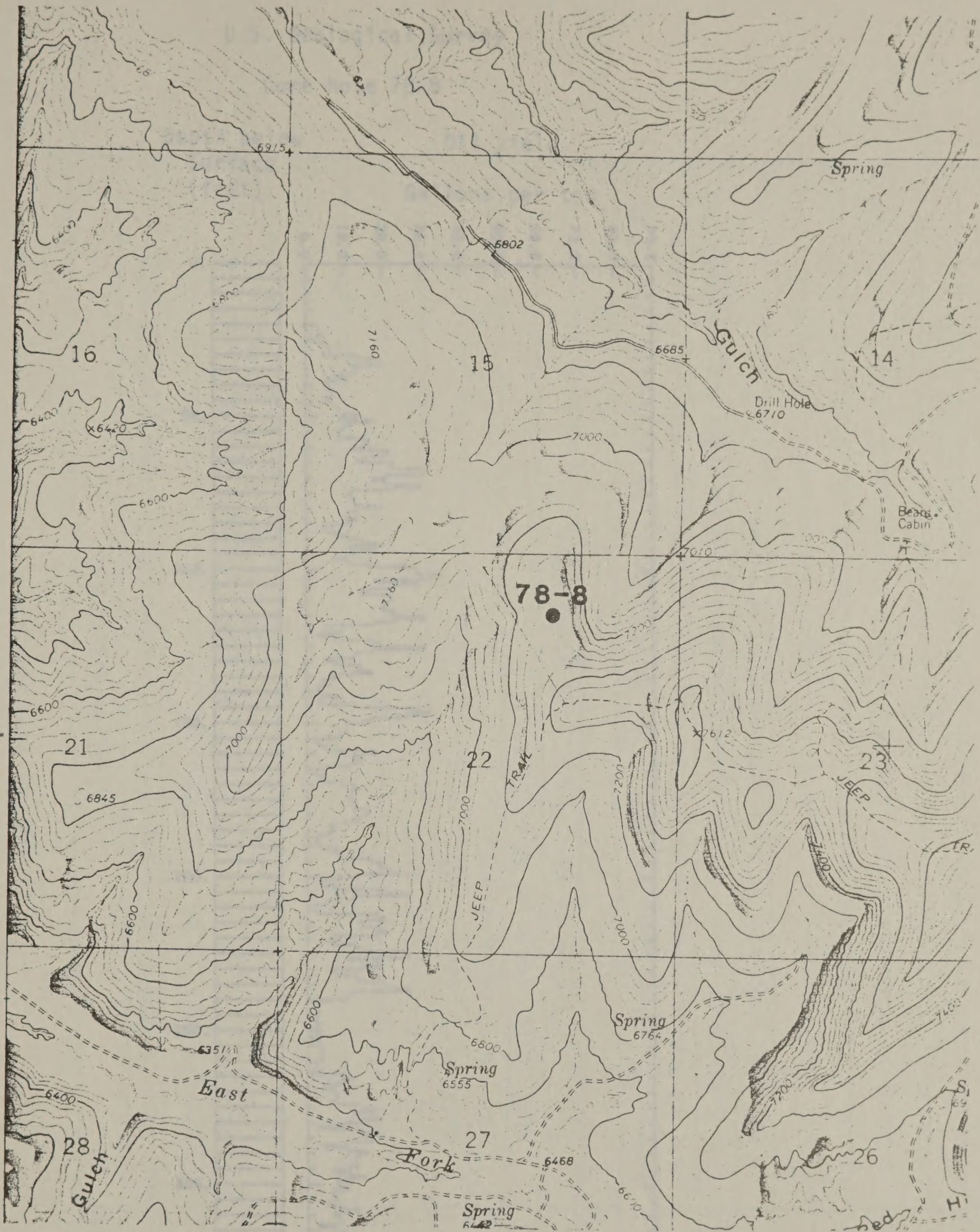
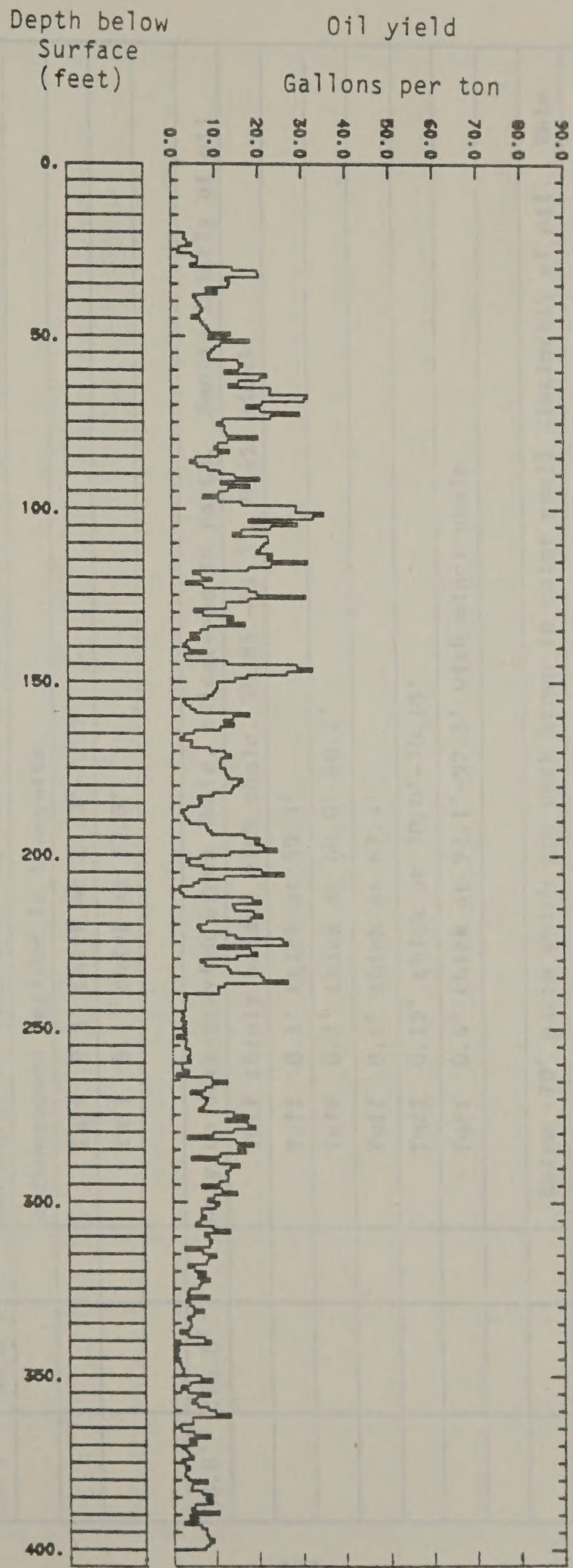


Figure 9.--Map showing location of core hole 78-8. Base from Calamity Ridge Quadrangle (1962). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-8



Corehole 78-8

Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
20.0'	38.0'		Dark gray to gray (rust where weathered) shale, smells faintly of oil with
			carbonaceous residue in fractures.
			Tuff 0.2' thick at 21.3'-21.5'
			Tuff 0.1' thick at 37.8'
38.0'	276.8'		Gray to dark-grayish brown shale, calcareous in parts. Smells faintly of oil
			Tuff thinly bedded with shale. 50.85'-51.3', 0.45' thick
			Tuff 0.1' thick at 59.3'
			Tuff 0.2' thick at 60.0'-60.2'
			Tuff 0.1' thick at 67.3'
			Tuff 0.15' thick at 70.0'-70.15'
			Tuff 0.4' thick at 92.1'-92.5' with minor shale
			Below ~70' parts which are dark brown in color smell distinctly of oil. This
			unit is highly broken up with some vertical fractures and many slickensides
			with brecciated zones. Fault striations occur both parallel and perpendicular
			to the dip, which can be from horizontal to vertical.

Corehole 78-8 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.1' thick at 104.8'
			Tuff 0.1' thick at 121.4'
			Tuff 0.3' thick at 132.2'-132.5' with minor shale
			Below ~135' the shale is getting soft and greasy in texture, indicating abundant clay.
			Tuff 0.1' thick at 165.3'
			Tuff 0.1' thick at 183.2'
			Tuff 0.2' thick at 186.2'-186.4'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.2' thick at 197.8-198.0' with oil staining
			Tuff 0.15' thick at 234.75'-234.9'
			Drilling was switched at 238.0' from 2½" (H) core to 1½" (NQ) core using a
			colloid based mud, with the 3½" drill pipe used as casing.
			Ostrocod fossils beginning at 259.7', rich beds
			>0.1' thick are listed
			Ostrocods 0.2' thick at 261.0'-261.2'
			Ostrocods 0.1' thick at 262.2'=262.3'
			Ostrocods 1.8' thick at 262.8'-264.6' (~50% shale)
			Ostrocods 0.5' thick at 265.0'-265.5'
			Ostrocods 0.5' thick at 266.0'-266.5'
			Tuff 0.1' thick at 273.4'

Corehole 78-8 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
276.8'	310.0'		Dark brown to tan rich oil shale, thinly bedded with little turbation and
			some tuff. Low in carbonate.
			Tuff 0.1' thick at 279.0'
			Tuff 0.15' thick at 279.1'-279.25'
			Tuff 0.1' thick at 279.5'
			Tuff 0.1' thick at 282.0'
			Tuff 0.2' thick at 284.6-284.9'
			Tuff 0.9' thick at 296.5'-287.4' with ~50% shale
			Tuff 0.1' thick at 300.4'
			At ~305' the hole started absorbing water at ~5 $ft^3 \cdot hr^{-1}$
			Tuff 0.55' thick at 300.5'-301.05'
			Tuff 0.4' thick at 302.0'-302.4'
			Tuff 0.15' thick at 302.6'-302.75'
			Tuff 0.15' thick at 303.0'-303.15'
			Limestone 0.1' thick at 309.3' Dirty
			Limestone 0.2' thick at 309.8'-310.0' Dirty
310.0'	413.3'		Gray to brownish-gray oil shale, moderately lean, thinly bedded with little
			turbation. Tuffs common with some gray clay layers. Low in carbonates, except
			in dirty limestone layers with and without ostrocods.
			Tuff 0.3' thick at 313.2'-313.5'
			Limestone 0.1' thick at 317.2' Dirty

Corehole 78-8 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Tuff 0.15' thick at 317.9-318.05'
			Limestone 0.2' thick at 318.6'-318.8' Dirty w/ostrocods
			Limestone 0.1' thick at 319.2' Dirty
			Limestone 0.3' thick at 320.7'-321.0' Dirty
			Limestone 0.1' thick at 321.4' Dirty
			Limestone 0.2' thick at 321.9'-322.1' Dirty
			Limestone 0.1' thick at 322.3' Dirty
			Limestone 0.1' thick at 322.6' Dirty w/ostrocods
			Limestone 0.1' thick at 322.8' Dirty w/ostrocods
			Limestone 0.2' thick at 325.5'-325.7' Dirty w/ostrocods
			Limestone 0.3' thick at 326.4'-326.7' Dirty
			Limestone 0.1' thick at 327.3' Dirty
			Limestone 0.1' thick at 328.3' Dirty
			Limestone 0.1' thick at 330.0' Dirty
			Limestone 0.1' thick at 331.4' Dirty
			Limestone 0.4' thick at 336.7'-337.1' Dirty
			Limestone 0.3' thick at 337.9-338.2' Dirty w/ostrocods with limestone pebbles
			Limestone 0.15' thick at 340.05'-340.2' Dirty
			Limestone 0.1' thick at 341.0' Dirty w/ostrocods
			Limestone 0.2' thick at 342.5'-342.7' Dirty w/ostrocods
			Water Saturated Limestone 7.6' thick at 343.0'-350.6' Dirty w/ostrocods
			Limestone 0.3' thick at 351.5'-351.8' Dirty

Corehole 78-8 (Continued)

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			Limestone 0.2' thick at 352.7'-352.9' Dirty
			Limestone 0.3' thick at 353.7-354.0' Dirty
			Limestone 0.1' thick at 355.8'-355.9' Dirty
			Limestone 0.15' thick at 356.15-'356.3' Dirty
			Limestone 0.35' thick at 356.6'-356.95' Dirty
			Limestone 0.2' thick at 360.2'-360.4' Dirty
			Limestone 0.2' thick at 361.7'-361.9' Dirty
			Limestone 0.2' thick at 362.0'-362.2' Dirty
Due to sinking of 3½"			Limestone 0.1' thick at 362.5' Dirty
casing, a 1' length was added to top when coring			Limestone 0.4' thick at 364.0'-364.4' Dirty
was at 352'.			Limestone 0.3' thick at 368.0'-368.3' Dirty w/ostrocods
			Limestone 0.15' thick at 371.05'-371.2' Dirty
			Limestone 0.15' thick at 372.45'-372.6' Dirty
At 372' the 1' add on			Limestone 0.3' thick at 374.5'-374.8' Dirty
section of casing was removed and a 5' section			Limestone 0.2' thick at 381.0'-381.2' Dirty
added on and drilled to			Limestone 0.1' thick at 383.8' Dirty
241'.			Limestone 0.6' thick at 388.0'-388.6' Dirty
			Limestone 0.2' thick at 390.1'-390.3' Dirty
			Limestone 0.6' thick at 392.1-392.7' Dirty w/ostrocods
			Limestone 0.6' thick at 399.8'-400.4- Dirty w/ostrocods

Corehole 78-8 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Limestone 0.1' thick at 403.2' with ostrocods
			Limestone 0.2' thick at 403.3'-403.5' with ostrocods
			Limestone 0.2' thick at 403.9'-404.1' with ostrocods
			Limestone 0.15' whick at 404.2'-404.35' with ostrocods
			Limestone 0.2' thick at 405.7'-405.9' with ostrocods
			Limestone 0.15' thick at 410.0'-410.15' with ostrocods
			Limestone 0.6' thick at 410.7'-411.3' Dirty
413.3'	434.6'		Brown to gray lean oil shale with and without carbonate parts have intermixed ostrocods and larger fossils of snails and bivalves. Splits with larger fossils marked by black "X" on core. Massive limestone >0.1' thick noted. Silty in lower 5'.
Due to sinking of casing a 1' length was added to top, total casing depth ~242'			Limestone 0.3' thick at 415.3'-415.6'
			Limestone 0.2' thick at 417.4'-417.6'
			Diamond bit changed at 432.1'
434.6'	452.9'		Fine white to gray calcite cemented quartz sandstone, mixed with shale in places, also interbedded. Shaley segments are calcitic, with ostrocods and carbonized plant remains. Larger fossils common in parts.

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
452.9'	454.6'		Massive shale (claystone), dark gray and relatively soft and brittle largely without carbonate with many slickensides. May be fault gouge.
454.6'	458.1'		Gray to dark-gray calcitic shale
458.1'	466.1'		Light-gray silty clayey limestone or calcite rich dirty siltstone. Fossils uncommon.
466.1'	467.7'		Gray to brown and black calcitic shale, thinly bedded with siderite (?) nodules. No oil smell.
467.7'	475.1'		Medium-grained gray to white well-sorted moderately well-rounded quartz sandstone. Massive with calcite and silica cement, soft in upper 1' where leached. Some parts water saturated. Less well sorted in lower 2'. By 470' water loss rate down the drill hole had increased to about 15 ft.^{3} hr.$^{-1}$.
475.1'	491.3'		Calcite-rich claystone, clayey siltstone, and fine-grained poorly sorted sandstone, light gray to gray, interbedded with poorly defined horizons on a scale of about 1'. Fossils or calcitic nodules common. Lowest 0.5' is very dark brown non-calcitic shale.

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
491.4'	495.8		Sandstone, medium to very coarse grained, poorly sorted with high angle bedding dips, possibly cross bedding. Tan to light gray with calcite and silicia cement. Parts are water saturated. Lowermost 2' mixed and bedded with shale and carbonaceous material.
495.8'	505.1'		Shale gray to dark brown, silty and largely calcitic. Siderite nodule at 496.9'. Fossiliferous units with bivalve shells at 497.2'-497.4', 0.2' thick. 499.3'-500.6', 1.3' thick
505.1'	507.4'		Sandstone, medium grained light gray, massive, well sorted with calcite cement.
507.4'	557.9'		Light-gray calcareous claystone with sandy units interbedded on a scale of about a foot. Fossils common. Dark-brown to gray and light-gray calcitic shale and claystone from 525.9' to 533.6', 7.7' thick. Sandstone unit, white to light gray, interbedded with minor shale, fine grained with calcite cement. 535.0'-542.5', 7.5' thick.
			At 558.3', the 3" casing was advanced to 248' and additional pipe added on top to remedy casing sinking beyond seals.

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
557.9'	575.4'		Gray shale, calcitic, medium to thinly bedded with some turbation. Snails and bivalve fossils common, ostrocods intermixed and abundant.
575.4'	605.5'		Calcitic gray to light-gray claystone, shale, siltstone, and poorly sorted sandstone interbedded and mixed. Fossiliferous with ostrocods and larger fossils.
			After a four-day break, water remained in the hole to a depth of about 120', from an original depth of about 40'.
			At ~450' depth the hole had caved in and had to be reamed upon reinsertion of the drill pipe to the hole bottom at 602.1'.
			Light-gray to white fine-grained moderately-sorted calcite cemented sandstone interbedded with calcitic clayey siltstone or mudstone.
			At 602.1'-604.0', 1.9' thick.
			by ~615' water loss rate down the drill hole has increased to ~20 ft.^{3} hr.$^{-1}$.
			Fine-grained poorly sorted sandstone, gray with calcite cement, from 604.95'-605.5', 0.55' thick.

Corehole 78-8 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
605.5'	630.0'		Gray to dark-gray calcitic shale, several zones gray to black and smell faintly of oil. Thinly bedded with little turbation, ostrocods and other fossils common particularly below 611.7'.
			Due to the 3½" casing sinking below its seals, it was advanced to 251' and a 5' section added on top.
			Noncalcareous gray claystone at 617.4'-617.9', 0.5' thick.

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 drilled in sec. 22, T. 1 N., R. 100 W., Rio Blanco County, Colorado

Depth		Yield of product: Weight percent				Yield of product: Gal per ton		Specific gravity of oil at 60°/60° F
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
20.0-21.0		1.2	5.2	92.4	1.2	3.2a	12.5	.920
21.0-22.0		1.1	3.7	94.3	.9	2.9a	8.9	.920
22.0-23.0		1.4	5.5	92.0	1.1	3.6a	13.2	.920
23.0-24.0		1.9	5.0	92.0	1.1	4.8a	12.0	.920
24.0-25.0		.7	5.5	92.9	.9	1.9a	13.2	.920
25.0-26.0		.6	5.5	92.4	1.5	1.6a	13.2	.920
26.0-27.0		1.9	5.2	91.7	1.2	4.9a	12.5	.920
27.0-28.0		2.3	5.0	91.6	1.1	6.2	12.0	.886
28.0-29.0		2.3	4.5	91.9	1.3	6.1	10.8	.894
29.0-30.0		1.7	6.0	91.0	1.3	4.5a	14.4	.920
30.0-31.0		5.4	4.4	88.4	1.8	14.2	10.5	.909
31.0-32.0		7.6	4.0	85.7	2.7	19.9	9.6	.915
32.0-33.0		7.7	3.2	85.3	3.8	20.2	7.7	.920
33.0-34.0		4.8	2.9	90.6	1.7	12.6	7.0	.909
34.0-35.0		5.1	3.6	88.7	2.6	13.6	8.6	.904
35.0-36.0		4.9	3.9	89.3	1.9	13.2	9.3	.896
36.0-37.0		3.0	2.7	93.2	1.1	8.1	6.5	.887
37.0-38.0		4.0	3.0	90.7	2.3	10.7	7.2	.897
38.0-39.0		1.9	3.6	93.2	1.3	5.1a	8.6	.920
39.0-40.0		2.2	3.4	93.1	1.3	5.8	8.1	.889
40.0-41.0		2.3	3.2	93.0	1.5	6.3	7.7	.885
41.0-42.0		2.5	3.6	92.4	1.5	6.9	8.6	.878
42.0-43.0		2.7	3.8	92.1	1.4	7.3	9.1	.878
43.0-44.0		2.4	3.6	92.5	1.5	6.6	8.6	.866
44.0-45.0		1.8	3.6	93.4	1.2	4.8a	8.6	.920
45.0-46.0		2.5	3.3	92.7	1.5	6.8	7.9	.883
46.0-47.0		2.7	3.4	92.5	1.4	7.4	8.1	.877
47.0-48.0		3.1	3.1	92.3	1.5	8.3	7.4	.884
48.0-49.0		3.2	3.6	91.4	1.8	8.8	8.6	.885
49.0-50.0		5.1	3.9	88.9	2.1	13.8	9.3	.892
50.0-51.0		3.2	3.7	91.5	1.6	8.7	8.9	.891
51.0-52.0		6.9	3.4	87.4	2.3	18.2	8.1	.907
52.0-53.0		4.3	5.0	88.8	1.9	11.4	12.0	.896
53.0-54.0		3.7	4.0	90.6	1.7	10.1	9.6	.880
54.0-55.0		3.4	3.7	90.7	2.2	9.3	8.9	.881
55.0-56.0		3.1	3.8	91.6	1.5	8.5	9.1	.876
56.0-57.0		3.2	3.6	91.6	1.6	8.8	8.6	.883
57.0-58.0		5.8	3.5	88.6	2.1	15.5	8.4	.897
58.0-59.0		6.2	4.3	87.3	2.2	16.6	10.3	.898
59.0-60.0		5.9	3.7	88.5	1.9	15.7	8.9	.891
60.0-61.0		4.6	5.5	87.9	2.0	12.4	13.2	.886
61.0-62.0		8.4	4.0	84.4	3.2	22.2	9.6	.901
62.0-63.0		7.8	3.5	86.3	2.4	20.5	8.4	.914
63.0-64.0		5.9	3.9	88.2	2.0	15.6	9.3	.909
64.0-65.0		5.0	2.9	89.5	2.6	13.3	7.0	.900

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
65.0-66.0	8.8	3.7	85.0	2.5	23.1	8.9	.912
66.0-67.0	8.6	3.0	86.0	2.4	22.7	7.2	.910
67.0-68.0	11.9	3.9	80.9	3.3	31.5	9.3	.907
68.0-69.0	11.6	4.0	81.2	3.2	30.7	9.6	.909
69.0-70.0	8.0	3.5	86.0	2.5	21.0	8.4	.907
70.0-71.0	6.5	3.5	88.1	1.9	17.4	8.4	.894
71.0-72.0	7.8	3.8	86.0	2.4	20.6	9.1	.902
72.0-73.0	11.2	3.5	82.1	3.2	29.7	8.4	.906
73.0-74.0	8.8	3.9	84.0	3.3	22.9	9.3	.915
74.0-75.0	4.4	3.9	90.3	1.4	11.9	9.3	.890
75.0-76.0	3.9	3.7	91.2	1.2	10.6	8.9	.882
76.0-77.0	4.6	3.0	91.0	1.4	12.4	7.2	.885
77.0-78.0	4.6	3.2	91.1	1.1	12.3	7.7	.888
78.0-79.0	4.7	3.7	90.2	1.4	12.8	8.9	.890
79.0-80.0	7.6	2.9	87.0	2.5	20.0	7.0	.906
80.0-81.0	4.9	3.8	89.0	2.3	13.0	9.1	.904
81.0-82.0	4.0	4.3	89.8	1.9	10.8	10.3	.895
82.0-83.0	3.7	3.0	91.1	2.2	9.9	7.2	.889
83.0-84.0	5.0	3.5	90.0	1.5	13.5	8.4	.888
84.0-85.0	4.0	3.6	91.0	1.4	10.8	8.6	.882
85.0-86.0	2.0	4.0	91.3	2.7	5.6	9.6	.872
86.0-87.0	1.5	3.3	94.6	.5	4.3a	7.9	.920
87.0-88.0	2.2	3.7	93.0	1.1	6.0	8.9	.871
88.0-89.0	3.1	3.7	91.7	1.5	8.5	8.9	.878
89.0-90.0	4.1	3.1	91.5	1.2	11.2	7.4	.890
90.0-91.0	5.6	3.0	89.6	1.8	14.7	7.2	.915
91.0-92.0	7.8	3.2	86.5	2.5	20.4	7.7	.918
92.0-93.0	4.4	1.7	92.8	1.1	11.4	4.1	.919
93.0-94.0	6.9	2.8	88.1	2.2	18.2	6.7	.914
94.0-95.0	4.9	3.1	90.7	1.3	13.1	7.4	.895
95.0-96.0	4.1	3.1	91.6	1.2	11.0	7.4	.889
96.0-97.0	2.7	3.3	92.7	1.3	7.3	7.9	.896
97.0-98.0	4.2	3.1	91.2	1.5	11.0	7.4	.906
98.0-99.0	6.2	3.0	88.9	1.9	16.4	7.2	.910
99.0-100.0	11.0	2.9	82.6	3.5	28.9	7.0	.916
100.0-101.0	10.8	4.0	82.0	3.2	28.7	9.6	.901
101.0-102.0	13.3	3.5	79.5	3.7	35.1	8.4	.904
102.0-103.0	12.3	3.7	80.3	3.7	32.7	8.9	.901
103.0-104.0	6.8	3.7	87.3	2.2	17.8	8.9	.916
104.0-105.0	11.1	3.7	82.1	3.1	29.1	8.9	.915
105.0-106.0	8.8	3.8	85.0	2.4	22.9	9.1	.918
106.0-107.0	6.1	3.7	88.2	2.0	16.2	8.9	.897
107.0-108.0	5.2	3.3	89.5	2.0	14.2	7.9	.884
108.0-109.0	8.4	2.9	85.7	3.0	22.3	7.0	.899
109.0-110.0	8.4	2.7	86.7	2.2	22.4	6.5	.896

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
110.0-111.0	8.0	2.3	87.7	2.0	21.3	5.5	0.895
111.0-112.0	7.8	2.1	87.4	2.7	20.6	5.0	.905
112.0-113.0	7.4	3.2	86.9	2.5	19.7	7.7	.902
113.0-114.0	8.7	3.8	85.0	2.5	23.3	9.1	.895
114.0-115.0	8.3	3.8	85.2	2.7	22.1	9.1	.900
115.0-116.0	11.8	3.3	81.3	3.6	31.4	7.9	.900
116.0-117.0	8.5	3.7	85.1	2.7	23.0	8.9	.891
117.0-118.0	6.5	4.0	87.3	2.2	17.7	9.6	.882
118.0-119.0	1.9	3.5	92.9	1.7	4.9a	8.4	.920
119.0-120.0	2.5	2.7	93.6	1.2	6.8	6.5	.879
120.0-121.0	3.4	3.0	92.4	1.2	9.4	7.2	.883
121.0-122.0	1.3	3.9	93.8	1.0	3.3a	9.3	.920
122.0-123.0	2.7	3.2	92.9	1.2	7.3	7.7	.887
123.0-124.0	6.8	2.7	88.2	2.3	17.9	6.5	.909
124.0-125.0	7.4	1.6	88.4	2.6	19.7	3.8	.905
125.0-126.0	11.8	3.0	81.9	3.3	30.9	7.2	.911
126.0-127.0	6.6	3.5	87.2	2.7	17.7	8.4	.889
127.0-128.0	4.6	3.5	89.0	2.9	12.6	8.4	.884
128.0-129.0	4.7	3.0	90.3	2.0	12.5	7.2	.894
129.0-130.0	2.0	3.5	92.8	1.7	5.1a	8.4	.920
130.0-131.0	2.7	3.2	92.1	2.0	7.2	7.7	.908
131.0-132.0	4.5	3.2	89.6	1.7	14.3	7.7	.915
132.0-133.0	4.8	3.0	90.9	1.3	12.7	7.2	.912
133.0-134.0	6.4	3.5	87.8	2.3	16.9	8.4	.909
134.0-135.0	3.1	2.7	92.9	1.3	8.4	6.5	.880
135.0-136.0	2.4	2.9	92.8	1.9	6.6	7.0	.873
136.0-137.0	1.6	3.4	93.9	1.1	4.2a	8.1	.920
137.0-138.0	2.3	3.6	92.9	1.2	6.3	8.6	.883
138.0-139.0	1.3	4.3	93.4	1.0	3.4a	10.3	.920
139.0-140.0	1.0	4.8	92.5	1.7	2.6a	11.5	.920
140.0-141.0	1.5	4.0	93.7	0.8	3.9a	9.6	.920
141.0-142.0	2.9	3.7	92.2	1.2	8.0	8.9	.881
142.0-143.0	1.0	3.8	94.2	1.0	2.8a	9.1	.920
143.0-144.0	1.2	3.7	94.0	1.1	3.1a	8.9	.920
144.0-145.0	4.8	2.9	91.2	1.1	12.8	7.0	.909
145.0-146.0	11.0	3.0	82.9	3.1	29.0	7.2	.906
146.0-147.0	12.3	3.5	80.4	3.8	32.4	8.4	.912
147.0-148.0	10.3	3.3	83.0	3.4	26.6	7.9	.925
148.0-149.0	6.5	3.6	87.9	2.0	17.4	8.6	.901
149.0-150.0	5.4	3.6	89.2	1.8	14.6	8.6	.881
150.0-151.0	3.8	3.4	91.0	1.8	10.4	8.1	.877
151.0-152.0	3.8	3.2	90.1	2.9	10.5	7.7	.879
152.0-153.0	3.6	3.6	91.5	1.3	10.0	8.6	.866
153.0-154.0	3.4	4.0	91.3	1.3	9.4	9.6	.863
154.0-155.0	3.0	3.5	90.6	2.9	8.3	8.4	.871

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
155.0-156.0	1.0	4.9	93.0	1.1	2.5a	11.7	.920
156.0-157.0	1.2	4.5	93.2	1.1	3.1a	10.8	.920
157.0-158.0	1.6	4.5	92.6	1.3	4.2a	10.8	.920
158.0-159.0	2.0	3.7	93.3	1.0	5.4	8.9	.864
159.0-160.0	6.7	3.5	87.5	2.3	17.9	8.4	.902
160.0-161.0	5.3	3.5	89.5	1.7	14.1	8.4	.901
161.0-162.0	4.4	3.5	90.6	1.5	11.9	8.4	.883
162.0-163.0	5.3	3.6	89.3	1.8	14.3	8.6	.892
163.0-164.0	4.0	3.5	89.7	2.8	11.1	8.4	.874
164.0-165.0	1.9	3.4	93.5	1.2	5.0a	8.1	.920
165.0-166.0	1.1	2.9	95.2	.8	2.8a	7.0	.920
166.0-167.0	.7	3.0	95.6	.7	1.8a	7.2	.920
167.0-168.0	1.7	3.2	94.0	1.1	4.6a	7.7	.920
168.0-169.0	1.6	3.1	94.1	1.2	4.2a	7.4	.920
169.0-170.0	3.2	3.2	91.8	1.8	8.7	7.7	.871
170.0-171.0	4.6	2.9	90.7	1.8	12.3	7.0	0.884
171.0-172.0	5.1	3.2	89.4	2.4	13.6	7.4	.898
172.0-173.0	4.2	2.6	90.9	2.3	11.3	6.2	.892
173.0-174.0	4.1	2.9	91.4	1.6	11.0	7.0	.892
174.0-175.0	4.2	2.9	91.4	1.5	11.2	7.0	.891
175.0-176.0	4.6	2.8	90.4	2.2	12.3	6.7	.889
176.0-177.0	4.6	2.8	90.1	2.5	12.5	6.7	.892
177.0-178.0	4.9	2.8	89.7	2.6	13.1	6.7	.890
178.0-179.0	6.0	2.3	88.6	3.1	16.3	5.5	.888
179.0-180.0	5.7	2.8	89.1	2.4	15.3	6.7	.895
180.0-181.0	5.2	2.4	90.0	2.4	14.1	5.8	.895
181.0-182.0	5.1	3.0	88.6	3.3	13.7	7.2	.894
182.0-183.0	3.4	3.0	90.5	3.1	9.4	7.2	.882
183.0-184.0	2.1	2.5	92.6	2.8	5.8	6.0	.866
184.0-185.0	2.5	2.3	93.2	2.0	6.8	5.5	.864
185.0-186.0	2.2	2.9	92.3	2.6	6.2	7.2	.866
186.0-187.0	1.3	2.1	95.0	1.6	3.4a	5.0	.920
187.0-188.0	.8	2.2	94.9	2.1	2.0a	5.3	.920
188.0-189.0	1.0	2.2	95.4	1.4	2.7a	5.3	.920
189.0-190.0	1.2	2.4	94.5	1.9	3.1a	5.8	.920
190.0-191.0	1.5	2.6	94.0	1.9	3.9a	6.2	.920
191.0-192.0	2.8	2.5	92.6	2.1	7.8	6.0	.869
192.0-193.0	3.0	2.7	91.1	3.2	8.2	6.5	.870
193.0-194.0	3.3	3.2	90.7	2.8	9.1	7.7	.875
194.0-195.0	6.2	2.9	88.4	2.5	16.8	7.0	.890
195.0-196.0	7.5	2.8	86.7	3.0	20.2	6.7	.895
196.0-197.0	7.1	2.6	87.9	2.4	19.1	6.2	.888
197.0-198.0	8.0	3.4	86.5	2.1	21.2	8.1	.900
198.0-199.0	9.2	3.2	85.3	2.3	24.2	7.7	.908
199.0-200.0	4.9	3.2	89.1	2.8	13.3	7.7	.868

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From - To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
200.0-201.0	2.4	2.9	93.4	1.3	6.5	7.0	0.876
201.0-202.0	1.2	2.6	95.6	.6	3.2a	6.2	.920
202.0-203.0	1.5	2.5	94.0	2.0	3.9a	6.0	.920
203.0-204.0	2.7	3.3	92.9	1.1	7.2	7.9	.885
204.0-205.0	7.9	3.1	86.9	2.1	20.7	7.4	.920
205.0-206.0	10.0	3.7	83.5	2.8	25.8	8.9	.925
206.0-207.0	4.5	4.0	89.6	1.9	12.0	9.6	.895
207.0-208.0	2.2	4.3	91.8	1.7	6.1	10.3	.881
208.0-209.0	1.9	3.7	92.8	1.6	4.8a	8.9	.920
209.0-210.0	.6	2.9	95.3	1.2	1.6a	7.0	.920
210.0-211.0	.7	3.0	95.1	1.2	1.8a	7.2	.920
211.0-212.0	1.0	3.0	93.9	2.1	2.6a	7.2	.920
212.0-213.0	7.0	3.1	87.6	2.3	18.5	7.4	.911
213.0-214.0	7.7	3.3	86.5	2.5	20.5	7.9	.902
214.0-215.0	5.2	3.6	89.0	2.2	13.9	8.6	.892
215.0-216.0	5.4	3.6	89.2	1.8	14.4	8.6	.895
216.0-217.0	7.1	3.4	87.2	2.3	18.8	8.1	.911
217.0-218.0	7.8	3.5	86.0	2.7	20.8	8.4	.902
218.0-219.0	6.8	3.5	87.9	1.8	18.1	8.4	.904
219.0-220.0	2.9	3.5	91.1	2.5	7.9	8.4	.882
220.0-221.0	2.1	3.2	92.6	2.1	5.8	7.7	.883
221.0-222.0	2.4	3.7	92.7	1.2	6.5	8.9	.877
222.0-223.0	4.6	3.7	89.9	1.8	12.5	8.9	.884
223.0-224.0	5.5	3.1	88.9	2.5	14.7	7.4	.894
224.0-225.0	9.8	2.9	85.5	1.8	25.6	7.0	.921
225.0-226.0	10.2	3.5	84.3	2.0	26.6	8.4	.916
226.0-227.0	4.0	3.2	91.1	1.7	10.4	7.7	.914
227.0-228.0	6.9	3.0	88.7	1.4	18.1	7.2	.915
228.0-229.0	7.4	3.8	87.2	1.6	19.6	9.1	.908
229.0-230.0	5.6	3.3	89.7	1.4	14.9	7.9	.908
230.0-231.0	2.4	3.5	92.9	1.2	6.4	8.4	0.902
231.0-232.0	2.9	4.0	92.0	1.1	7.6	9.6	.900
232.0-233.0	4.9	3.2	90.8	1.1	12.9	7.7	.911
233.0-234.0	5.1	3.6	90.2	1.1	13.4	8.6	.915
234.0-235.0	7.8	2.7	86.3	3.2	20.4	6.5	.919
235.0-236.0	8.0	2.7	85.3	4.0	21.1	6.5	.906
236.0-237.0	10.1	2.2	84.5	3.2	26.7	5.3	.909
237.0-238.0	4.5	2.9	90.6	2.0	12.0	7.0	.905
238.0-239.0	4.0	2.4	91.4	2.2	10.5	5.8	.906
239.0-240.0	4.1	2.1	92.7	1.1	10.7	5.0	.917
240.0-241.0	1.0	1.9	96.3	.8	2.6a	4.6	.920
241.0-242.0	1.2	2.1	95.8	.9	3.2a	5.0	.920
242.0-243.0	1.1	2.6	95.5	.8	2.9a	6.2	.920
243.0-244.0	1.1	2.2	96.1	.6	2.9a	5.3	.920
244.0-245.0	1.1	1.9	96.4	.6	3.0a	4.6	.920

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
245.0	246.0	.8	2.2	95.3	1.7	2.1a	5.3	.920
246.0	247.0	1.0	2.0	96.2	.8	2.6a	4.8	.920
247.0	248.0	.7	2.2	96.2	.9	1.9a	5.3	.920
248.0	249.0	1.2	1.9	94.8	2.1	3.1a	4.6	.920
249.0	250.0	.8	1.9	96.6	.7	2.2a	4.6	.920
250.0	251.0	.9	1.7	96.8	.6	2.4a	4.1	.920
251.0	252.0	1.2	1.9	96.1	.8	3.2a	4.6	.920
252.0	253.0	.4	2.8	96.3	.5	1.0a	6.7	.920
253.0	254.0	1.2	2.0	96.4	.4	3.2a	4.8	.920
254.0	255.0	1.2	2.2	96.0	.6	3.0a	5.3	.920
255.0	256.0	1.1	2.0	95.9	1.0	2.9a	4.8	.920
256.0	257.0	1.5	2.3	95.4	.8	4.0a	5.5	.920
257.0	258.0	1.5	2.3	94.5	1.7	4.0a	5.5	.920
258.0	259.0	1.3	2.1	96.1	.5	3.4a	5.0	.920
259.0	260.0	1.6	1.9	96.1	.4	4.1a	4.6	.920
260.0	261.0	0.8	3.0	95.7	0.5	2.1a	7.2	.920
261.0	262.0	.9	1.7	97.0	.4	2.2a	4.1	.920
262.0	263.0	1.4	1.5	96.7	.4	3.7a	3.6	.920
263.0	264.0	.4	1.9	97.2	.5	1.0a	4.6	.920
264.0	265.0	3.3	1.3	94.4	1.0	9.0	3.1	.873
265.0	266.0	4.7	1.1	92.6	1.6	12.6	2.6	.888
266.0	267.0	3.4	.6	94.1	1.9	9.1	1.4	.888
267.0	268.0	2.8	2.0	93.7	1.5	7.5	4.8	.889
268.0	269.0	1.5	2.4	94.8	1.3	4.0a	5.8	.920
269.0	270.0	2.5	2.5	92.9	2.1	6.8	6.0	.900
270.0	271.0	3.0	2.0	93.8	1.2	8.1	4.8	.883
271.0	272.0	2.9	2.6	93.1	1.4	7.7	6.2	.894
272.0	273.0	2.7	2.5	92.8	2.0	7.2	6.0	.896
273.0	274.0	2.2	2.8	93.6	1.4	6.0	6.7	.888
274.0	275.0	5.3	1.9	90.2	2.6	14.1	4.6	.907
275.0	276.0	6.7	2.6	89.2	1.5	17.5	6.2	.910
276.0	277.0	4.6	2.6	91.7	1.1	12.1	6.2	.902
277.0	278.0	6.7	3.2	87.1	3.0	17.4	7.7	.924
278.0	279.0	7.4	3.1	87.4	2.1	19.1	7.4	.930
279.0	280.0	5.5	2.2	90.5	1.8	14.1	5.3	.930
280.0	281.0	3.6	2.3	92.6	1.5	9.3	5.5	.925
281.0	282.0	1.3	3.1	93.9	1.7	3.3a	7.4	.920
282.0	283.0	5.7	3.0	89.7	1.6	14.6	7.2	.934
283.0	284.0	7.3	2.8	87.5	2.4	18.7	6.7	.934
284.0	285.0	5.8	2.5	89.5	2.2	15.0	6.0	.931
285.0	286.0	6.6	3.0	88.4	2.0	16.9	7.2	.931
286.0	287.0	4.3	1.6	92.1	2.0	11.0	3.8	.932
287.0	288.0	1.6	1.8	95.5	1.1	4.3a	4.3	.920
288.0	289.0	4.0	2.9	91.9	1.2	10.5	7.0	.922
289.0	290.0	5.9	3.1	89.1	1.9	15.4	7.4	.926

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
290.0-291.0	5.1	3.4	90.3	1.2	13.3	8.1	0.924
291.0-292.0	4.7	2.3	91.9	1.1	12.3	5.5	.920
292.0-293.0	4.8	3.2	90.8	1.2	12.8	7.7	.895
293.0-294.0	4.7	2.7	91.4	1.2	12.8	6.5	.885
294.0-295.0	3.9	4.0	91.2	.9	10.8	9.6	.872
295.0-296.0	2.5	3.2	92.3	2.0	6.7	7.7	.877
296.0-297.0	4.2	3.4	91.3	1.1	11.3	8.1	.886
297.0-298.0	5.6	3.5	89.6	1.3	14.8	8.4	.904
298.0-299.0	3.5	3.6	91.6	1.3	9.5	8.6	.885
299.0-300.0	2.9	3.4	92.5	1.2	8.1	8.1	.870
300.0-301.0	4.0	2.6	92.1	1.3	10.7	6.2	.887
301.0-302.0	3.6	2.2	93.0	1.2	9.8	5.3	.887
302.0-303.0	2.4	1.9	94.8	.9	6.6	4.6	.873
303.0-304.0	2.4	3.9	92.8	.9	6.6	9.3	.875
304.0-305.0	2.8	4.0	91.5	1.7	7.6	9.6	.882
305.0-306.0	2.4	3.2	93.2	1.2	6.3	7.7	.890
306.0-307.0	2.0	3.6	93.6	.8	5.3	8.6	.887
307.0-308.0	3.6	3.4	91.7	1.3	9.4	8.1	.913
308.0-309.0	5.0	3.7	89.9	1.4	13.2	8.9	.913
309.0-310.0	2.8	2.0	94.0	1.2	7.3	4.8	.932
310.0-311.0	3.2	3.5	91.6	1.7	8.4	8.4	.919
311.0-312.0	3.4	3.6	91.4	1.6	9.0	8.6	.894
312.0-313.0	3.1	4.0	91.3	1.6	8.5	9.6	.889
313.0-314.0	1.0	2.0	95.4	1.6	2.7a	4.8	.920
314.0-315.0	2.5	4.0	92.1	1.4	6.9	9.6	.878
315.0-316.0	3.7	3.8	91.1	1.4	10.0	9.1	.883
316.0-317.0	3.0	3.8	91.2	2.0	8.2	9.1	.893
317.0-318.0	2.8	3.1	92.7	1.4	7.7	7.4	.885
318.0-319.0	1.3	1.7	96.1	.9	3.4a	4.1	.920
319.0-320.0	1.9	2.8	93.9	1.4	4.9a	6.7	.920
320.0-321.0	2.7	2.2	93.9	1.2	7.5	5.3	.878
321.0-322.0	2.1	2.8	94.0	1.1	5.6	6.7	.892
322.0-323.0	3.2	2.3	93.3	1.2	8.5	5.5	.902
323.0-324.0	2.4	3.3	93.1	1.2	6.4	7.9	.893
324.0-325.0	2.2	3.2	93.5	1.1	5.9	7.7	.895
325.0-326.0	1.4	2.4	95.5	.7	3.7a	5.8	.920
326.0-327.0	1.2	2.3	96.1	.4	3.2a	5.5	.920
327.0-328.0	3.1	3.6	92.1	1.2	8.3	8.6	.906
328.0-329.0	1.1	3.9	93.9	1.1	2.9a	9.3	.920
329.0-330.0	1.4	2.8	95.2	.6	3.8a	6.7	.920
330.0-331.0	1.8	2.8	94.9	.5	4.7a	6.7	.920
331.0-332.0	2.6	2.7	93.8	.9	7.0	6.5	.882
332.0-333.0	1.8	3.7	93.4	1.1	4.7a	8.9	.920
333.0-334.0	1.3	3.4	94.0	1.3	3.3a	8.1	.920
334.0-335.0	1.5	4.5	92.9	1.1	4.0a	10.8	.920

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil1/	Water	Specific gravity of oil at 60°/60° F
335.0-336.0	1.6	3.3	94.0	1.1	4.2a	7.9	.920
336.0-337.0	1.4	2.8	94.9	.9	3.7a	6.7	.920
337.0-338.0	.6	2.8	95.6	1.0	1.5a	6.7	.920
338.0-339.0	1.3	2.5	95.5	.7	3.5a	6.0	.920
339.0-340.0	2.7	3.1	93.0	1.2	7.2	7.4	.891
340.0-341.0	3.2	2.3	93.1	1.4	8.6	5.5	.880
341.0-342.0	.2	1.1	97.0	1.7	.6a	2.6	.920
342.0-343.0	.5	2.4	96.2	.9	1.2a	5.8	.920
343.0-344.0	.4	1.5	97.3	.8	.9a	3.6	.920
344.0-345.0	.3	1.5	97.7	.5	.7a	3.6	.920
345.0-356.0	.4	1.3	97.6	.7	.9a	3.1	.920
346.0-347.0	.6	.6	97.7	1.1	1.6a	1.4	.920
347.0-348.0	.7	.7	98.2	.4	1.8a	1.7	.920
348.0-349.0	.9	.6	98.0	.5	2.3a	1.4	.920
349.0-350.0	.8	.6	98.2	.4	2.0a	1.4	.920
350.0-351.0	2.3	1.9	94.9	0.9	6.2	4.6	.881
351.0-352.0	3.4	2.5	93.0	1.1	8.9	6.0	.909
352.0-353.0	1.4	2.4	94.4	1.8	3.8a	5.8	.920
353.0-354.0	.7	2.0	96.6	.7	1.7a	4.8	.920
354.0-355.0	1.3	3.3	94.5	.9	3.3a	7.9	.920
355.0-356.0	3.1	2.4	93.1	1.4	8.5	5.8	.877
356.0-357.0	2.0	1.3	95.9	.8	5.3	3.1	.886
357.0-358.0	1.6	3.5	94.6	.3	4.1a	8.4	.920
358.0-359.0	2.0	3.4	93.0	1.6	5.6	8.1	.878
359.0-360.0	3.0	3.3	92.1	1.6	8.0	7.9	.886
360.0-361.0	3.5	3.2	91.5	1.8	9.7	7.7	.877
361.0-362.0	4.9	2.2	90.4	2.5	13.1	5.3	.899
362.0-363.0	1.6	2.1	95.4	.9	4.2a	5.0	.920
363.0-364.0	1.7	3.0	94.3	1.0	4.4a	7.2	.920
364.0-365.0	.5	1.8	96.5	1.2	1.3a	4.3	.920
365.0-366.0	.6	2.3	96.5	.6	1.7a	5.5	.920
366.0-367.0	1.8	2.4	94.9	.9	4.7a	5.8	.920
367.0-368.0	3.2	2.4	93.1	1.3	8.4	5.8	.911
368.0-369.0	1.4	1.4	96.7	.5	3.5a	3.4	.920
369.0-370.0	2.0	2.4	94.1	1.5	5.2	5.8	.906
370.0-371.0	.6	2.4	96.6	.4	1.7a	5.8	.920
371.0-372.0	1.1	2.6	95.8	.5	2.9a	6.2	.920
372.0-373.0	1.3	2.4	95.0	1.3	3.5a	5.8	.920
373.0-374.0	1.7	2.3	95.3	.7	4.5a	5.5	.920
374.0-375.0	.7	.6	98.1	.6	1.8a	1.4	.920
375.0-376.0	1.0	2.6	95.8	.6	2.5a	6.2	.920
376.0-377.0	1.4	2.3	95.3	1.0	3.6a	5.5	.920
377.0-378.0	1.0	2.4	96.1	.5	2.6a	5.8	.920
378.0-379.0	.9	2.5	96.0	.6	2.4a	6.0	.920
379.0-380.0	1.3	2.9	95.1	.7	3.3a	7.0	.920

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-8 (Continued)

Depth From To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
380.0-381.0	2.9	2.6	93.4	1.1	7.7	6.2	0.911
381.0-382.0	1.6	.8	96.5	1.1	4.2a	1.9	.920
382.0-383.0	1.5	.8	96.0	.7	3.9a	4.3	.920
383.0-384.0	2.5	1.4	95.0	1.1	6.5	3.4	.916
384.0-385.0	3.3	2.9	92.3	1.5	8.8	7.0	.898
385.0-386.0	2.7	3.2	92.7	1.4	7.4	7.7	.874
386.0-387.0	3.2	3.2	92.1	1.5	8.9	7.7	.874
387.0-388.0	1.9	2.1	94.9	1.1	4.9a	5.0	.920
388.0-389.0	1.5	1.5	95.5	1.5	3.9a	3.6	.920
389.0-390.0	3.9	2.9	91.0	2.2	10.4	7.0	.904
390.0-391.0	1.4	2.2	95.1	1.4	3.5a	5.3	.920
391.0-392.0	2.1	2.8	92.7	2.4	5.7a	6.7	.890
392.0-393.0	.9	.9	97.2	1.0	2.4a	2.2	.920
393.0-394.0	2.4	3.2	92.7	1.7	6.4	7.7	.882
394.0-395.0	2.9	3.4	91.9	1.8	7.6	8.1	.899
395.0-396.0	2.9	2.5	92.9	1.7	7.6	6.0	.907
396.0-397.0	3.1	2.7	92.2	2.0	8.0	6.5	.921
397.0-398.0	3.5	2.6	92.0	1.9	9.2	6.2	.921
398.0-399.0	3.1	2.6	92.5	1.8	8.1	6.2	.907
399.0-400.0	2.8	1.4	94.4	1.4	7.3	3.4	.901

1/ "a"--indicates specific gravity estimated as 0.92.

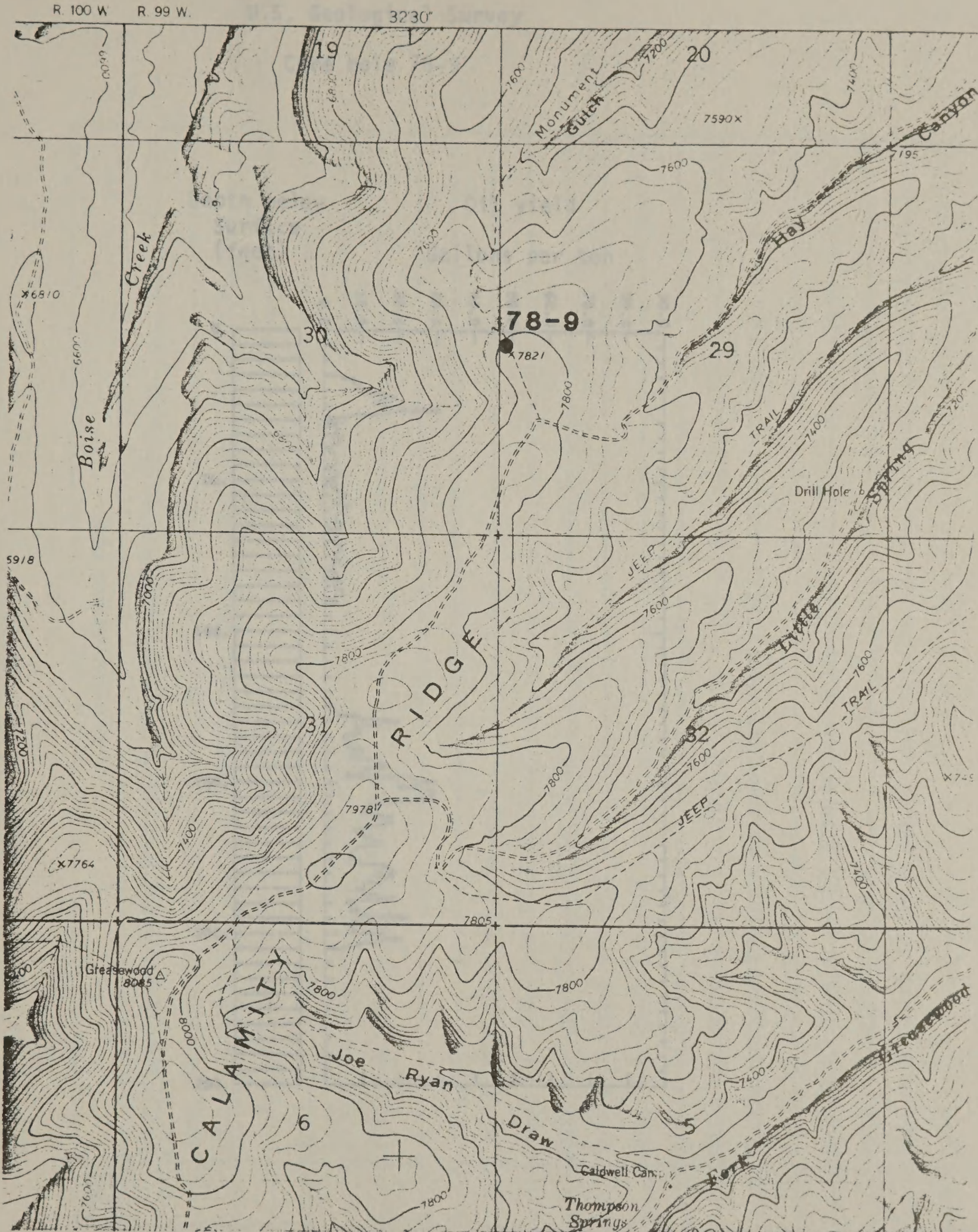
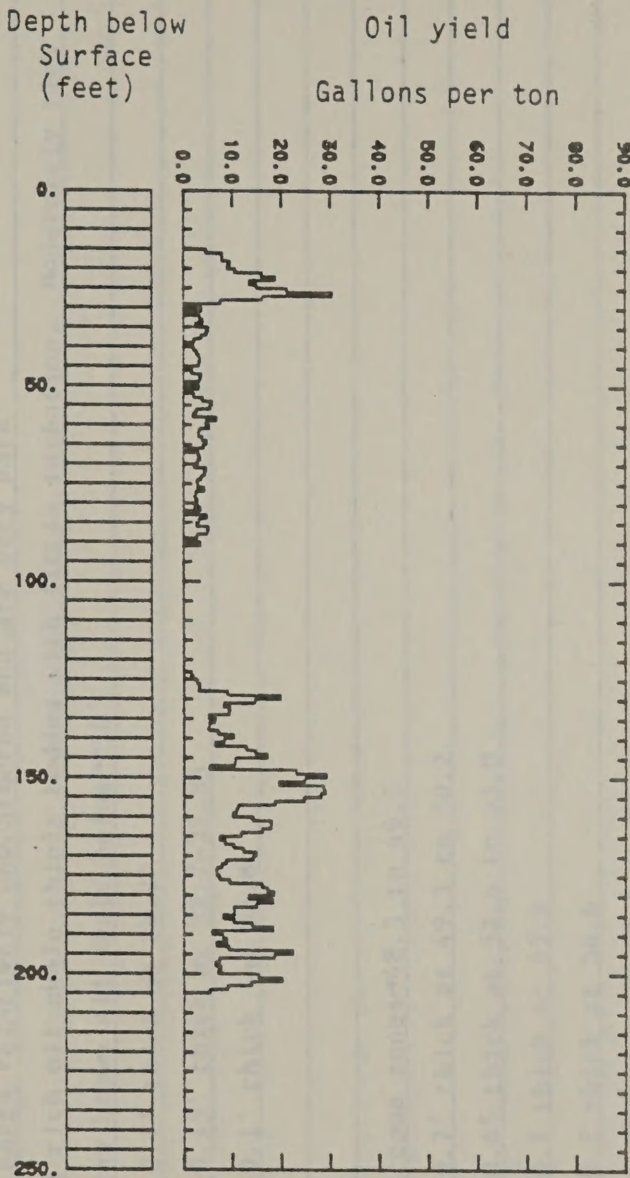


Figure 10.--Map showing location of core hole 78-9. Base from Calamity Ridge Quadrangle (1962). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-9



Corehole 78-9

Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
15.0	91.9		Oil shale interbedded with tuff, bleached and weathered.
			Some parts relatively unweathered and are very dark
			Brown rich oil shale thinly bedded with little turbation. Moderately rich
			to gray brown oil shale below ~50'
			Tuff 0.1' thick at 28.7'
			Tuff 0.15' thick at 32.7-32.85
			Tuff 0.1' thick at 36.8
			Tuffaceous zone ~48.5 to 49.5
			Tuff 0.7' thick at 49.5 to 50.2
			Tuff 0.4' thick at 52.6 to 53.0
			Tuff 0.1 thick at 53.9
			Tuff 0.2 thick at 56.6
			Tuff 0.5' thick at 58.1 to 58.6
			Tuff 0.2 thick at 65.7' - 65.9'
			Oxidized leached zone with numerous open pits
			0.3' thick at 65.9' - 66.2
			Tuff 0.1 thick at 67.6' with minor shale
			Tuff 0.1' thick at 86.2
			Tuff 0.3' thick at 90.8'-91.1'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
91.9	121.7		Tuffaceous zone, numerous thick and thin tuffs
			turbated and interlayered with some dark brown
			Oil shale. Tuffs are gray to dark gray. ~80 percent tuff
121.7	128.9		Brown to tan lean oil shale thinly interbedded and
			in parts turbated with thin tuffs. ~50 percent tuff
			At 127.15', 0.5' tuff with abundant solution cavities
128.9	134.4		Dark gray brown to black oil shale thinly interbedded
			with thin tuffs
134.4	141.5		Brown to tan lean oil shale with abundant thinly interbedded tan tuff.
141.5	204.9		Similar to interval 128.9 - 134.4'
			Tuff 0.15' thick at 143.6 - 142.75'
			Tan to brown oil shale with tuff 145.9' -147.0
			Tan to brown oil shale with tuff 158.3 - 160.6'
			Tuff 0.1' thick at 164.4'
			Tan to dark brown oil shale with tan thinly interbedded tuff. 166.0-169.4
			and 171.5 - 177.9'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Brown to dark gray brown oil shale interbedded with tan tuff.
			182.5 - 187.5'
			and 188.9 - 204.9

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9 drilled in sec. 29, T. 2 N., R. 99 W., Rio Blanco County, Colorado

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
15	16			93.8	2.8	4.6	4.0	.920 *
16	17			94.6	1.1	7.9	3.0	.923
17	18			93.9	1.2	7.9	4.5	.923
18	19			93.2	1.4	9.5	4.2	.921
19	20			92.6	1.7	9.0	5.5	.916
20	21			92.6	1.4	10.6	4.7	.905
21	22			90.6	1.9	16.0	3.6	.905
22	23			87.4	2.7	18.7	6.6	.906
23	24			88.9	2.2	13.5	9.2	.911
24	25			87.8	2.5	14.9	9.5	.917
25	26			85.5	2.9	21.2	8.0	.933
26	27			83.2	3.1	30.4	4.8	.925
27	28			88.9	2.3	16.1	6.3	.923
28	29			92.2	1.8	7.5	7.5	.924
29	30			94.9	1.6	N.D.	8.3	———
30	31			92.5	2.2	3.7	9.3	.920 *
31	32			94.2	1.9	TRACE	9.3	.920 *
32	33			93.7	1.4	3.3	8.7	.920 *
33	34			95.2	0.8	3.9	6.0	.920 *
34	35			96.0	0.9	2.5	5.2	.920 *
35	36			95.8	1.0	5.0	3.3	.920 *
36	37			95.7	1.1	4.7	3.3	.922
37	38			96.2	1.0	3.6	3.3	.920 *
38	39			96.3	1.5	2.1	3.3	.920 *
39	40			96.4	1.5	0.3	4.6	.920 *
40	41			95.9	1.5	2.1	4.3	.920 *
41	42			95.6	1.8	2.7	3.7	.920 *
42	43			96.3	1.6	3.1	2.3	.920 *
43	44			96.5	1.4	3.3	2.0	.920 *
44	45			97.5	0.4	3.1	2.2	.920 *

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil[1/]	Water	
45	46			97.6	0.7	0.5	3.5	.920 *
46	47			97.6	0.3	1.7	3.6	.920 *
47	48			97.0	0.7	3.6	2.4	.920 *
48	49			96.9	1.0	3.3	1.9	.920 *
49	50			98.5	0.5	0.7	1.8	.920 *
50	51			97.9	<0.1	3.1	2.1	.920 *
51	52			96.9	1.8	0.6	2.6	.920 *
52	53			96.4	1.3	2.1	2.4	.920 *
53	54			96.2	1.5	3.9	1.7	.920 *
54	55			95.2	1.6	5.8	2.4	.920
55	56			96.7	0.2	5.4	2.4	.920 *
56	57			98.0	<0.1	2.6	2.5	.920 *
57	58			98.0	<0.1	2.0	3.4	.920 *
58	59			95.9	0.6	6.7	2.3	.917
59	60			95.5	0.7	4.5	4.7	.920 *
60	61			95.6	0.8	5.2	4.1	.920 *
61	62			97.0	0.8	3.2	2.4	.920 *
62	63			97.2	0.6	3.0	2.4	.920 *
63	64			95.9	0.8	3.8	4.4	.920 *
64	65			95.8	0.9	4.7	3.6	.920 *
65	66			94.3	0.8	4.0	7.9	.920 *
66	67			95.4	1.2	TRACE	8.2	.920 *
67	68			95.1	1.3	3.0	5.8	.920 *
68	69			95.5	1.3	3.4	4.5	.920 *
69	70			95.7	1.4	2.8	4.4	.920 *
70	71			96.1	0.9	2.3	5.0	.920 *
71	72			95.4	1.0	4.6	4.4	.920 *
72	73			95.1	1.0	4.3	5.2	.920 *
73	74			96.2	0.9	3.6	3.6	.920 *
74	75			95.6	1.1	2.8	5.4	.920 *
75	76			97.2	<0.1	2.9	4.2	.920 *
76	77			96.8	<0.1	4.2	4.3	.920 *
77	78			97.4	<0.1	2.5	4.7	.920 *
78	79			97.0	0.3	2.3	4.5	.920 *
79	80			96.5	0.7	2.8	4.4	.920 *

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
80	81			95.8	0.3	2.2	7.1	.920 *
81	82			96.0	0.3	3.4	5.8	.920 *
82	83			96.5	0.6	TRACE	6.9	.920 *
83	84			95.7	1.0	4.7	3.5	.920 *
84	85			96.6	0.7	3.1	3.6	.920 *
85	86			96.5	0.5	2.7	4.7	.920 *
86	87			96.5	0.1	5.1	3.5	.920 *
87	88			95.7	1.3	4.8	2.9	.920 *
88	89			96.8	1.2	2.7	2.4	.920 *
89	90			97.3	0.9	TRACE	4.3	.920 *
90	91			96.7	1.1	3.4	2.3	.920 *
91	95			97.2	1.4	TRACE	3.3	.920 *
96	100			98.8	<0.1	N.D.	4.2	——
101	105			97.9	0.6	N.D.	3.6	——
106	110			98.3	0.6	N.D.	2.6	——
111	115			98.4	0.5	N.D.	2.6	——
116	120			97.7	0.4	N.D.	4.5	——
120	122			96.4	1.2	N.D.	5.7	——
123	124			96.2	1.2	1.5	4.9	.920 *
124	125			97.0	0.8	1.9	3.5	.920 *
125	126			97.4	0.6	2.7	2.3	.920 *
126	127			96.4	1.6	3.2	1.8	.920 *
127	128			96.5	0.9	3.0	3.6	.920 *
128	129			94.2	1.0	9.0	3.2	.922
129	130			87.9	1.8	19.7	6.6	.928
130	131			90.4	2.2	14.5	4.4	.914
131	132			93.6	1.4	8.1	4.6	.912
132	133			93.7	1.3	9.4	3.3	.913
133	134			94.3	0.6	9.2	3.6	.921
134	135			95.3	0.8	5.1	4.7	.915
135	136			96.0	0.5	6.4	2.4	.912
136	137			96.2	0.8	5.1	2.4	.915
137	138			95.7	1.3	5.0	2.4	.920 *
138	139			95.5	0.9	7.0	2.3	.916
139	140			93.4	1.7	10.2	2.4	.909

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil 1/	Water	
140	141			94.8	1.1	8.2	2.5	.915
141	142			96.0	0.6	6.4	2.4	.930
142	143			91.6	1.5	12.8	4.7	.920
143	144			89.9	1.9	14.7	5.8	.934
144	145			90.2	1.9	17.0	3.5	.913
145	146			93.2	1.5	10.5	3.1	.920
146	147			93.5	1.5	10.4	2.3	.921
147	148			94.8	1.3	5.2	4.6	.908
148	149			85.6	3.1	23.0	5.7	.927
149	150			84.6	2.8	29.1	3.5	.909
150	151			86.5	2.5	24.8	3.6	.918
151	152			86.9	2.7	19.4	7.2	.920
152	153			84.4	2.8	28.6	4.8	.908
153	154			84.7	2.3	28.9	4.8	.910
154	155			85.1	2.4	28.0	4.2	.917
155	156			85.2	3.4	24.6	4.7	.918
156	157			88.7	2.2	18.6	4.8	.915
157	158			92.4	0.9	11.1	5.8	.922
158	159			94.2	0.7	10.7	2.4	.921
159	160			93.9	1.3	10.0	2.4	.920
160	161			91.3	2.0	14.1	3.1	.911
161	162			88.5	2.7	17.9	4.9	.915
162	163			88.4	2.6	17.8	5.2	.922
163	164			89.1	2.2	16.0	5.9	.930
164	165			91.5	1.8	11.7	5.1	.937
165	166			95.0	0.7	7.3	3.5	.920 *
166	167			95.3	0.5	8.4	2.3	.924
167	168			94.2	0.9	10.2	2.4	.916
168	169			93.0	1.4	12.2	2.4	.913
169	170			90.9	1.5	14.8	4.8	.914
170	171			90.8	1.3	14.2	5.8	.929
171	172			94.1	0.8	8.7	4.1	.927
172	173			95.2	0.9	7.7	2.4	.911
173	174			96.1	0.3	6.7	2.5	.923
174	175			95.9	0.7	6.7	1.7	.933

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
175	176			95.5	0.7	7.3	2.4	.921
176	177			94.4	1.0	9.4	2.4	.911
177	178			90.9	2.0	16.0	2.4	.915
178	179			90.5	1.4	17.2	3.5	.926
179	180			89.3	1.8	18.4	4.6	.910
180	181			91.4	1.4	13.3	4.7	.934
181	182			89.9	1.6	18.2	3.6	.910
182	183			90.9	1.9	14.9	3.5	.917
183	184			93.7	1.5	10.2	2.5	.894
184	185			94.0	1.1	10.4	2.4	.886
185	186			94.6	1.3	8.1	2.4	.912
186	187			94.8	0.4	10.3	2.2	.902
187	188			93.0	0.8	14.0	2.4	.901
188	189			89.3	1.3	18.2	5.8	.914
189	190			96.1	0.6	5.8	2.7	.910
190	191			95.3	1.0	8.0	1.7	.902
191	192			94.5	1.2	8.8	2.3	.913
192	193			94.4	1.8	6.7	3.0	.908
193	194			94.5	1.1	9.2	2.3	.913
194	195			87.4	2.3	22.3	4.3	.916
195	196			89.3	2.1	18.5	3.6	.920
196	197			95.3	0.9	7.2	2.5	.917
197	198			95.3	0.9	6.5	3.1	.908
198	199			94.8	1.0	7.6	3.1	.910
199	200			94.4	1.5	7.1	3.3	.924
200	201			90.3	1.9	15.3	4.7	.922
201	202			86.8	2.9	20.1	6.1	.926
202	203			91.7	1.5	13.8	3.5	.937
203	204			93.7	1.3	8.9	3.8	.923
204	204.9			94.0	1.9	5.3	4.9	.932

* Assumed Specific Gravity

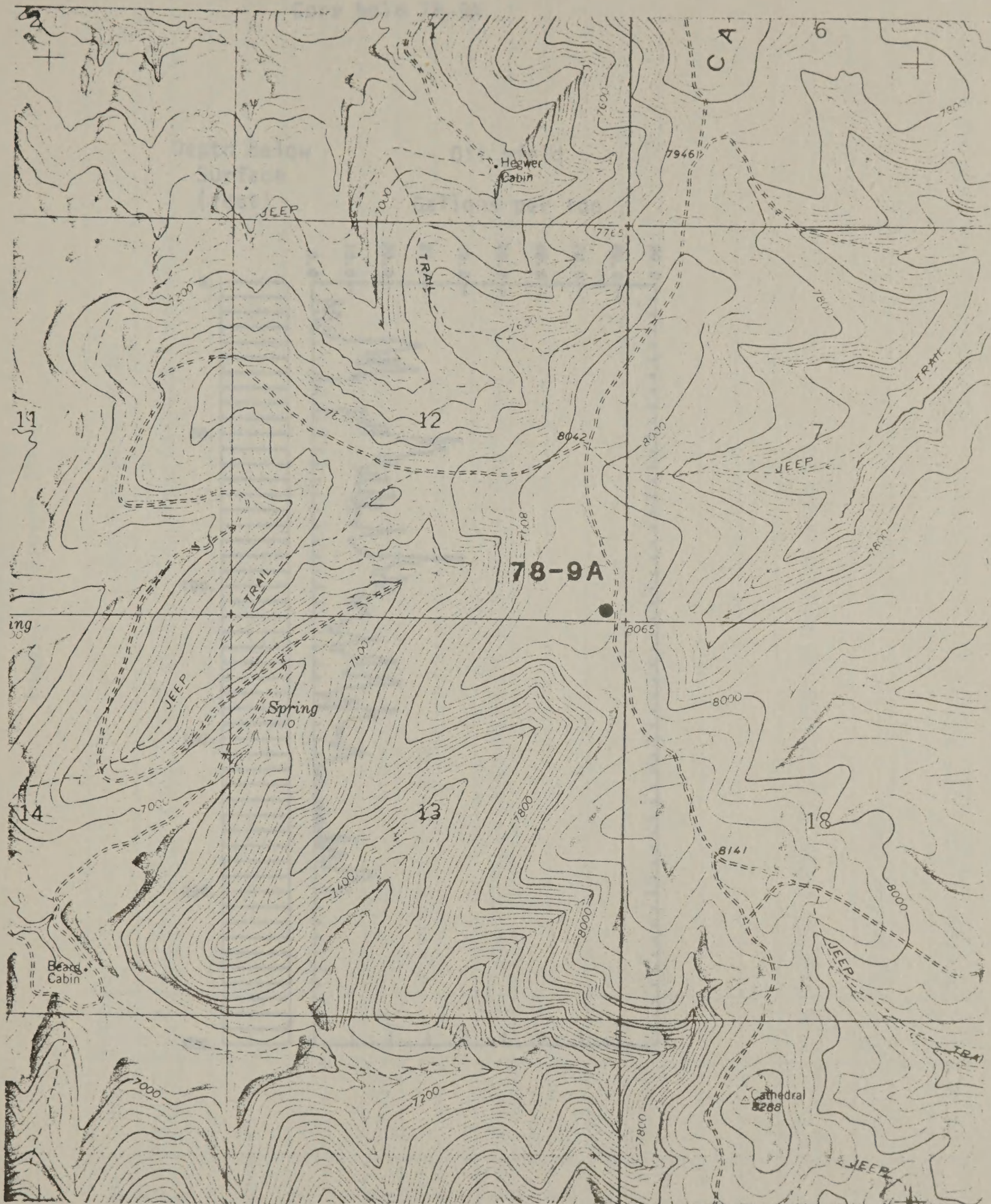
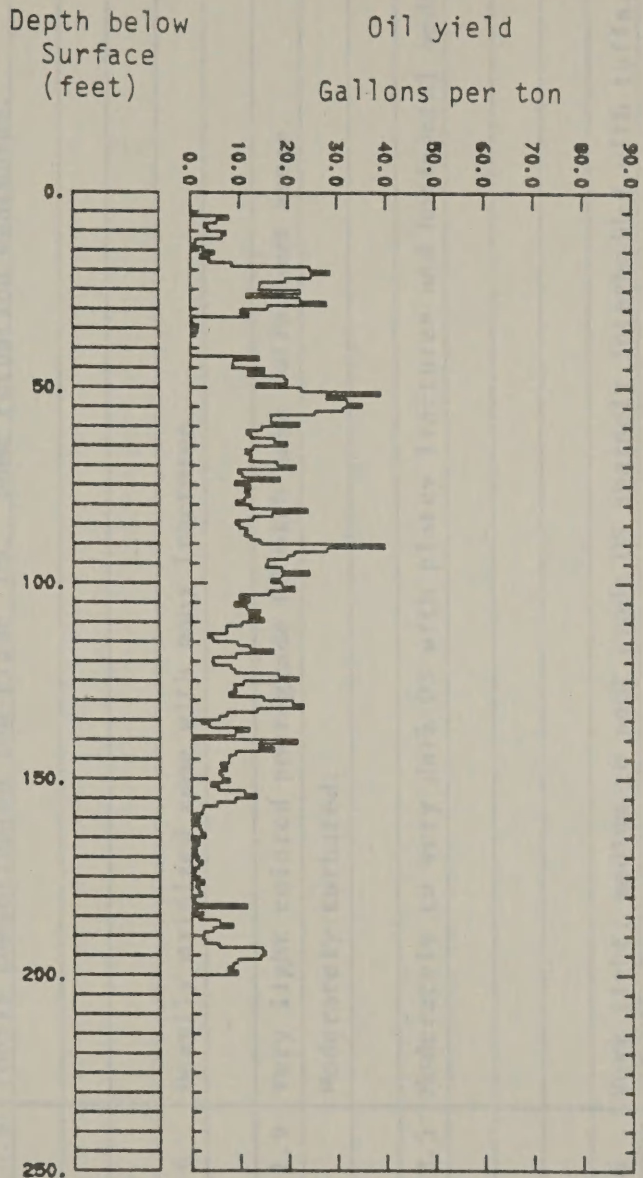


Figure 11.--Map showing location of core hole 78-9A. Base from Calamity Ridge Quadrangle (1962). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-9A



Corehole 78-9A

Logged by Steven Ihnen

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
6'	12.6'	6.6	Poorly consolidated low-grade OS. Some turbation weathered.
12.6'	16.6'	4	Heavily oxidized zone with many fractures
16.6'	18.5'	1.9	Very light colored poor-grade OS with some tuffaceous areas.
			Moderately turbated.
18.5'	21.0'	3.5	Moderately to very dark OS with platey fractures and horizontal bedding
21.0'	27.0'	6	Very light, medium to poor grade OS sparsely interbedded with tuffs.
27.0'	29.6'	2.6	Medium brown mildy turbated medium grade OS.
29.6'	31.0'	1.4	Oxidation zone.
31.0'	32.0'	1	Similar to 21'-27' above.
32.0'	33.5'	1.5	Oxidation zone.

Corehole 78-9A (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
33.5'	37.0'	3.5	Medium brown, poor to fair grade OS turbated tuff at 35.2' (0.3' thick)
37.0'	43.0'	6	Oxidized shale
43.0'	47.4'	4.4	Light, poor to medium grade OS
47.4'	61.0'	24.6	Mixed light to medium, fair to poor-grade OS tuff at 52.6'.
61.0'	61.5	1.2	Oxidation/tuff zone
61.5'	65.0'	3.5	Dark fairly rich OS
65.0'	81.0'	16	Light poor grade OS
81'	82.5'	1.5	Tuffaceous zone ~>50% tuffs in beds
82.5'	88'	5.5	Same as 65-81 above
88'	93'	5	Somewhat darker, finely bedded poor-grade shale
93'	120'	27	Mixed light to medium brown, poor to fair grade shales thinly interbedded with tuffs. Some occurrence of salt.

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
120'	120.4'	.4	Tuff zone.
120.4'	131.4'	11	Same as 82.5-88 above.
131.4'	133.0'	2.6	Darker, vertically fractured material.
133.0'	138.5'	5.5	Very light poor OS.
138.5'	140.4'	1.9	Major tuff zone oxidation in fracture.
140.4'	142.0'	1.6	Darker mixed OS.
142.0'	161.6'	19.6	Very light very poor grade OS.
161.6'	161.9'	0.3	Very dark banded segment.
161.9'	164.5'	2.6	Similar to 142-161 above.
164.5'	167.5'	3.0	Siltstone?
167.5'	193.6'		Similar to 142-161 above interspersed w/higher grade OS in small bands. Fairly tuffaceous below ~187.

Corehole 78-9A (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
193.6'	196.0'	2.4	Dark-brown fairly rich OS heavily fractured.
196.0'	200.0		Light-brown low-grade OS.

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9A drilled in sec. 12, T. 1 N., R. 100 W.Rio Blanco County, Colorado

Depth From–To	Yield of product: weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
6.0-7.0	3.0	2.8	91.2	3.0	7.8	6.7	0.934
7.0-8.0	2.1	3.0	93.4	1.5	5.4	7.2	.934
8.0-9.0	1.1	3.6	94.0	1.3	2.8a	8.6	
9.0-10.0	1.4	2.2	95.0	1.4	3.6a	5.3	
10.0-11.0	2.8	2.3	93.4	1.5	7.3	5.5	.926
11.0-12.0	2.4	2.0	94.4	1.2	6.4	4.8	.921
12.0-13.0	.4	4.5	94.1	1.0	1.1a	10.8	
13.0-14.0	.3	1.6	97.3	.8	.8a	3.8	
14.0-15.0	1.0	1.5	96.2	1.3	2.7a	3.6	
15.0-16.0	1.9	1.3	95.7	1.1	4.9a	3.1	
16.0-17.0	.8	1.4	96.8	1.0	2.0a	3.4	
17.0-18.0	1.5	.8	96.9	.8	3.9a	1.9	
18.0-19.0	3.2	1.3	94.2	1.3	8.5	3.1	.919
19.0-20.0	9.5	2.6	85.4	2.5	24.5	6.2	.932
20.0-21.0	11.0	3.7	81.9	3.4	28.6	8.9	.924
21.0-22.0	9.5	2.1	85.6	2.8	24.7	5.0	.918
22.0-23.0	7.4	2.1	88.3	2.2	19.4	5.0	.914
23.0-24.0	5.4	1.8	90.7	2.1	14.2	4.3	.913
24.0-25.0	5.3	1.7	91.5	1.5	14.0	4.1	.912
25.0-26.0	8.7	2.1	86.8	2.4	22.6	5.0	.926
26.0-27.0	4.4	2.1	92.0	1.5	11.4	5.0	.915
27.0-28.0	8.6	2.4	86.3	2.7	22.5	5.8	.917
28.0-29.0	10.7	2.1	84.4	2.8	27.9	5.0	.916
29.0-30.0	6.1	2.3	89.7	1.9	15.8	5.5	.924
30.0-31.0	3.9	1.0	93.6	1.5	10.2	2.4	.906
31.0-32.0	4.5	1.0	93.3	1.2	11.9	2.4	.903
32.0-33.0	.0	3.0	96.4	.6	Trace	7.2	
33.0-34.0	.1	1.9	96.7	1.3	.3a	4.6	
34.0-35.0	.6	1.1	97.8	.5	1.6a	2.6	
35.0-36.0	.6	1.0	97.9	.5	1.5a	2.4	
36.0-37.0	0.4	0.9	98.2	0.5	1.0a	2.2	
37.0-38.0	.0	2.5	97.2	.3	No oil	5.9	
38.0-39.0	.0	3.1	96.6	.3	No oil	7.3	
39.0-40.0	.0	2.6	97.1	.3	No oil	6.2	
40.0-41.0	.0	2.8	96.8	.4	No oil	6.6	
41.0-42.0	.0	3.6	96.0	.4	No oil	8.7	
42.0-43.0	5.4	1.9	90.7	2.0	14.1	4.6	0.911
43.0-44.0	3.3	2.0	93.0	1.7	8.7	4.8	.916
44.0-45.0	3.2	1.4	94.2	1.2	8.5	3.4	.912
45.0-46.0	5.8	1.4	90.6	2.2	15.2	3.4	.911
46.0-47.0	4.4	1.5	92.6	1.5	11.7	3.6	.913
47.0-48.0	7.4	2.3	88.3	2.0	19.3	5.5	.919
48.0-49.0	7.7	2.5	87.4	2.4	19.9	6.0	.931

[illegible] ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9A (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil[1/]	Gal per ton: Water	Specific gravity of oil at 60°/60° F
49.0-50.0	5.2	1.7	92.0	1.1	13.5	4.1	.919
50.0-51.0	8.6	1.6	87.6	2.2	22.7	3.8	.906
51.0-52.0	14.7	1.5	80.0	3.8	38.9	3.6	.907
52.0-53.0	10.6	2.2	84.6	2.6	27.8	5.3	.914
53.0-54.0	12.3	2.4	82.3	3.0	32.1	5.8	.919
54.0-55.0	13.5	2.1	80.9	3.5	35.1	5.0	.920
55.0-56.0	11.9	2.5	82.2	3.4	31.2	6.0	.913
56.0-57.0	10.7	2.5	85.1	2.7	25.4	6.0	.917
57.0-58.0	6.3	1.7	90.1	1.9	16.4	4.1	.922
58.0-59.0	6.2	1.3	90.7	1.8	16.4	3.1	.909
59.0-60.0	8.5	2.6	86.3	2.6	22.3	6.2	.912
60.0-61.0	5.6	2.4	90.1	1.9	14.5	5.8	.930
61.0-62.0	4.4	2.0	92.1	1.5	11.4	4.8	.933
62.0-63.0	4.8	1.3	92.3	1.6	12.3	3.1	.926
63.0-64.0	6.6	1.3	90.5	1.6	17.2	3.1	.916
64.0-65.0	7.6	2.1	88.2	2.1	19.8	5.0	.925
65.0-66.0	4.9	1.6	91.9	1.6	12.7	3.8	.928
66.0-67.0	4.3	1.1	93.2	1.4	11.1	2.6	0.929
67.0-68.0	4.8	1.4	92.4	1.4	12.4	3.4	.932
68.0-69.0	4.6	1.3	92.9	1.2	12.0	3.1	.924
69.0-70.0	6.8	1.3	90.3	1.6	17.7	3.1	.915
70.0-71.0	8.2	1.8	88.1	1.9	21.5	4.3	.917
71.0-72.0	3.6	1.8	92.5	2.1	9.6	4.3	.915
72.0-73.0	4.0	1.2	93.5	1.3	10.6	2.9	.898
73.0-74.0	6.9	2.0	89.0	2.1	18.3	4.8	.910
74.0-75.0	3.4	1.2	94.1	1.3	9.0	2.9	.922
75.0-76.0	4.7	1.4	92.3	1.6	12.3	3.4	.920
76.0-77.0	4.2	1.4	92.2	2.2	11.0	3.4	.922
77.0-78.0	4.7	1.7	92.1	1.5	12.1	4.1	.920
78.0-79.0	4.2	1.3	92.4	2.1	11.0	3.1	.920
79.0-80.0	3.5	1.6	93.2	1.7	9.2	3.8	.922
80.0-81.0	4.7	1.9	91.9	1.5	12.2	4.6	.916
81.0-82.0	9.3	2.5	85.0	3.2	23.9	6.0	.930
82.0-83.0	6.4	1.6	90.4	1.6	16.7	3.8	.925
83.0-84.0	4.9	1.8	91.9	1.4	12.7	4.3	.922
84.0-85.0	3.5	2.4	92.9	1.2	9.1	5.8	.925
85.0-86.0	3.8	1.5	93.2	1.5	9.9	3.6	.925
86.0-87.0	4.4	1.5	94.4	1.7	11.5	3.6	.923
87.0-88.0	4.2	1.6	92.8	1.4	11.0	3.8	.915
88.0-89.0	4.7	1.6	92.1	1.6	12.3	3.8	.912
89.0-90.0	5.4	1.7	91.1	1.8	14.2	4.1	.909
90.0-91.0	14.9	1.9	79.3	3.9	39.7	4.6	.900
91.0-92.0	10.5	1.5	85.4	2.6	27.9	3.6	.905
92.0-93.0	7.9	1.2	89.0	1.9	21.1	2.9	.893
93.0-94.0	7.3	1.2	89.4	2.1	19.7	2.9	.894
94.0-95.0	6.0	1.0	91.2	1.8	15.7	2.4	.911
95.0-96.0	5.8	1.2	91.1	1.9	15.3	2.9	.911

Samples from the U.S. Geological Survey's Corehole 78-9A(Continued)

Depth From - To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil 1/	Water	Specific gravity of oil at 60°/60° F
96.0-97.0	7.1	0.9	89.8	2.2	18.6	2.2	0.920
97.0-98.0	9.1	1.5	87.3	2.1	24.2	3.6	.904
98.0-99.0	7.0	1.5	89.6	1.9	18.5	3.6	.910
99.0-100.0	6.2	1.4	90.9	1.5	16.4	3.4	.909
100.0-101.0	7.1	1.6	89.5	1.8	18.7	3.8	.909
101.0-102.0	8.0	1.7	88.1	2.2	21.1	4.1	.910
102.0-103.0	6.2	1.5	90.2	2.1	16.0	3.6	.921
103.0-104.0	3.8	1.7	93.4	1.1	9.8	4.1	.926
104.0-105.0	4.6	1.3	92.8	1.3	12.0	3.1	.928
105.0-106.0	3.4	1.3	94.3	1.0	8.8	3.1	.926
106.0-107.0	4.4	1.5	92.7	1.4	11.4	3.6	.923
107.0-108.0	5.4	1.6	91.6	1.4	14.1	3.8	.920
108.0-109.0	4.5	2.1	91.9	1.5	11.8	5.0	.919
109.0-110.0	5.8	2.2	90.7	1.3	14.9	5.3	.934
110.0-111.0	4.0	2.0	92.8	1.2	10.3	4.8	.929
111.0-112.0	2.7	1.6	94.9	.8	7.1	3.8	.924
112.0-113.0	2.8	2.0	94.3	.9	7.3	4.8	.920
113.0-114.0	1.3	2.0	96.2	.5	3.4a	4.8	
114.0-115.0	1.7	1.5	96.1	.7	4.4a	3.6	
115.0-116.0	3.6	1.9	93.2	1.3	9.5	4.6	.909
116.0-117.0	4.5	2.0	92.2	1.3	12.0	4.8	.904
117.0-118.0	6.3	1.5	90.8	1.4	16.8	3.6	.904
118.0-119.0	3.4	1.8	93.7	1.1	9.1	4.3	.898
119.0-120.0	1.7	3.0	94.2	1.1	4.4a	7.2	
120.0-121.0	1.7	3.4	93.7	1.2	4.5a	8.1	
121.0-122.0	3.0	2.1	93.8	1.1	8.1	5.0	.905
122.0-123.0	3.4	2.2	93.2	1.2	8.9	5.3	.922
123.0-124.0	6.9	2.0	89.5	1.6	17.9	4.8	.923
124.0-125.0	8.4	1.5	88.4	1.7	21.9	3.6	.914
125.0-126.0	4.1	1.4	93.2	1.3	10.6	3.4	.921
126.0-127.0	3.3	1.2	94.2	1.3	8.7	2.9	.919
127.0-128.0	3.4	1.1	94.3	1.2	9.1	2.6	.905
128.0-129.0	2.9	2.1	93.9	1.1	7.7	5.0	.901
129.0-130.0	5.7	1.7	90.2	2.4	14.8	4.1	.916
130.0-131.0	7.9	1.6	88.4	2.1	20.8	3.8	.911
131.0-132.0	8.8	1.8	87.4	2.0	22.9	4.3	.925
132.0-133.0	5.2	1.7	91.4	1.7	13.5	4.1	.921
133.0-134.0	2.8	2.0	94.3	.9	7.3	4.8	.920
134.0-135.0	2.2	1.9	95.1	.8	5.7	4.6	.920
135.0-136.0	.8	2.0	96.7	.5	2.1a	4.8	
136.0-137.0	1.4	1.3	96.8	.5	3.7a	3.1	
137.0-138.0	4.5	1.7	92.6	1.2	11.9	4.1	.916
138.0-139.0	3.4	2.4	92.7	1.5	8.9	5.8	.916
139.0-140.0	.3	4.4	94.8	.5	.7a	10.5	
140.0-141.0	8.3	1.8	88.0	1.9	21.7	4.3	.917
141.0-142.0	5.2	.8	92.7	1.3	13.7	1.9	.916
142.0-143.0	6.5	1.3	90.4	1.8	17.0	3.1	.913

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9A (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil[1/]	Gal per ton: Water	Specific gravity of oil at 60°/60° F
143.0	144.0	3.5	1.5	93.8	1.2	9.0	3.6	.924
144.0	145.0	3.0	1.5	94.5	1.0	7.7	3.6	.924
145.0	146.0	2.9	2.1	93.9	1.1	7.6	5.0	.924
146.0	147.0	2.3	2.0	95.0	.7	5.9	4.8	.927
147.0	148.0	2.8	2.0	94.3	.9	7.2	4.8	.925
148.0	149.0	2.2	1.8	95.3	.7	5.7	4.3	.919
149.0	150.0	2.4	1.6	95.2	.8	6.3	3.8	.923
150.0	151.0	3.0	1.4	94.3	1.3	7.8	3.4	.921
151.0	152.0	1.5	2.5	95.4	.6	4.0a	6.0	
152.0	153.0	2.1	2.0	95.3	.6	5.5	4.8	.920
153.0	154.0	4.2	2.4	91.6	1.8	10.9	5.8	.924
154.0	155.0	5.1	2.7	90.3	1.9	13.3	6.5	.923
155.0	156.0	3.4	2.7	92.2	1.7	9.0	6.5	.921
156.0	157.0	2.0	2.8	93.9	1.3	5.2	6.7	0.910
157.0	158.0	.9	2.7	95.7	.7	2.4a	6.5	
158.0	159.0	.8	3.9	94.7	.6	2.2a	9.3	
159.0	160.0	.3	5.0	94.0	.7	.8a	12.0	
160.0	161.0	.6	4.2	94.7	.5	1.6a	10.1	
161.0	162.0	.2	4.1	95.2	.5	.6a	9.8	
162.0	163.0	.6	3.2	95.6	.6	1.7a	7.7	
163.0	164.0	.8	2.9	95.0	1.3	2.0a	7.0	
164.0	165.0	1.1	1.2	97.0	.7	2.8a	2.9	
165.0	166.0	.2	.9	98.4	.5	.4a	2.2	
166.0	167.0	.6	1.4	97.3	.7	1.5a	3.4	
167.0	168.0	.3	1.3	97.8	.6	.8a	3.1	
168.0	169.0	.4	1.5	97.6	.5	.9a	3.6	
169.0	170.0	.4	1.5	97.5	.6	1.0a	3.6	
170.0	171.0	.4	1.6	97.1	.9	1.1a	3.8	
171.0	172.0	.8	1.7	96.4	1.1	2.2a	4.1	
172.0	173.0	.5	2.0	97.0	.5	1.4a	4.8	
173.0	174.0	.3	1.7	97.1	.9	.7a	4.1	
174.0	175.0	.2	1.5	97.7	.6	.5a	3.6	
175.0	176.0	.3	2.5	96.5	.7	.9a	6.0	
176.0	177.0	1.0	2.3	96.0	.7	2.5a	5.5	
177.0	178.0	.4	2.3	96.3	1.0	1.0a	5.5	
178.0	179.0	.6	2.6	95.8	1.0	1.5a	6.2	
179.0	180.0	.8	2.9	95.3	1.0	2.1a	7.0	
180.0	181.0	.2	2.7	96.3	.8	.6a	6.5	
181.0	182.0	.3	3.4	95.4	.9	.7a	8.1	
182.0	183.0	4.2	2.4	91.6	1.8	11.3	5.8	.893
183.0	184.0	.3	3.6	95.2	.9	.7a	8.6	
184.0	185.0	.9	1.5	96.7	.9	2.4a	3.6	
185.0	186.0	.6	.9	97.6	.9	1.5a	2.2	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-9A (Continued)

Depth From–To	Yield of product: Weight percent Oil	Weight percent Water	Weight percent Spent shale	Weight percent Gas + loss	Gal per ton Oil 1/	Gal per ton Water	Specific gravity of oil at 60°/60° F
186.0-187.0	2.2	0.8	95.8	1.2	5.8	1.9	0.912
187.0-188.0	3.2	.9	94.5	1.4	8.4	2.2	.913
188.0-189.0	1.7	.7	96.5	1.1	4.4a	1.7	
189.0-190.0	1.0	.7	97.4	.9	2.5a	1.7	
190.0-191.0	.9	.8	97.4	.9	2.2a	1.9	
191.0-192.0	1.0	.8	97.2	1.0	2.7a	1.9	
192.0-193.0	2.1	1.0	95.7	1.2	5.6	2.4	.919
193.0-194.0	5.5	1.2	91.3	2.0	14.5	2.9	.913
194.0-195.0	5.8	1.4	90.6	2.2	15.1	3.4	.920
195.0-196.0	5.4	1.7	90.9	2.0	14.1	4.1	.914
196.0-197.0	3.6	1.5	93.3	1.6	9.3	3.6	.912
197.0-198.0	3.2	.9	94.1	1.8	8.4	2.2	.912
198.0-199.0	2.8	1.0	94.8	1.4	7.4	2.4	.911
199.0-200.0	3.5	1.0	94.0	1.5	9.3	2.4	.909

1/ "a"--indicates specific gravity estimated as 0.92.

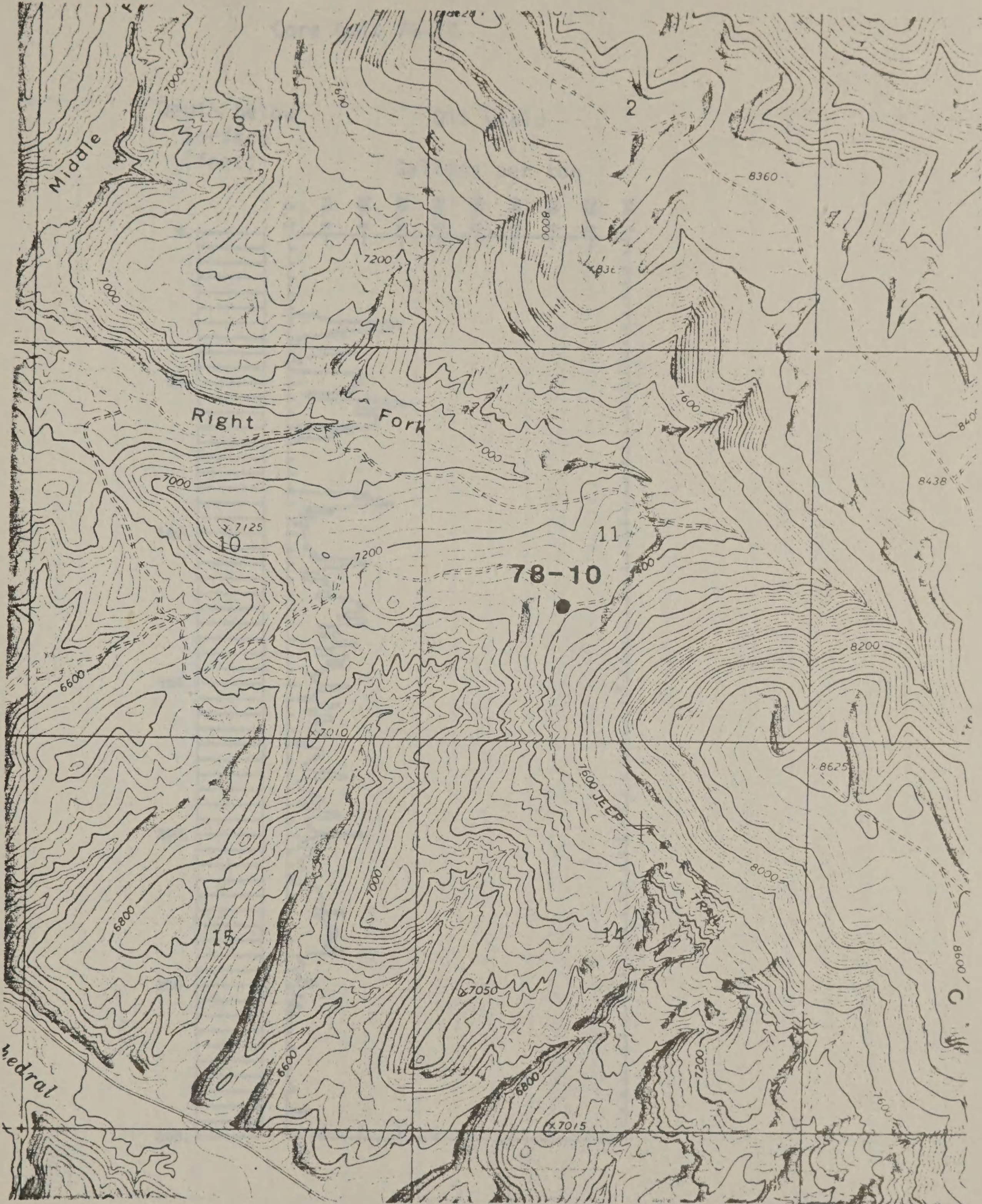
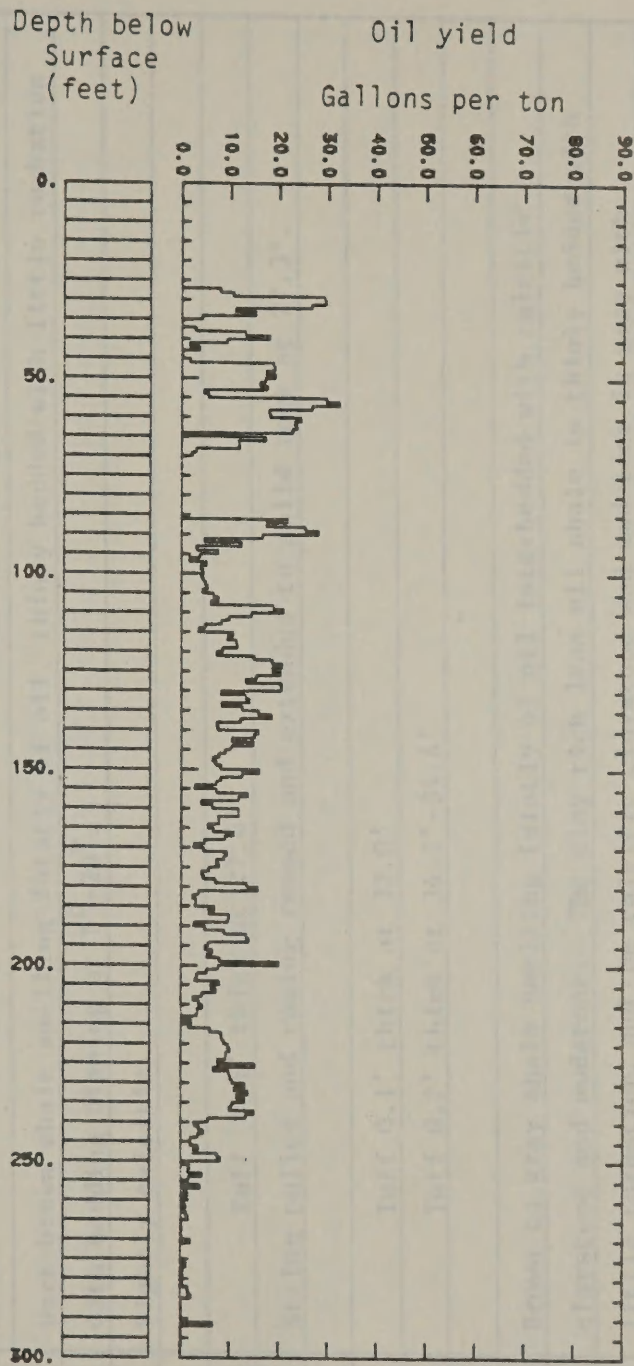


Figure 12.--Map showing location of core hole 78-10. Base from Black Cabin Gulch Quadrangle (1964). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-10



Corehole 78-10

Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
20.0'	27.3'		Loose slope debris, discarded
27.3'	34.9'		Dark-brown shale smelling faintly of oil, thinly bedded with little turbation
			with bedding dipping at 5^{o}-20^{o}.
			Sightly calcitic.
			Tuff 0.1' thick at 27.6'
			String pulled and casing reamed and extended to solid rock at 27.3'.
			Tuff 0.1' thick at 32.0'
			Tuff 0.2' thick at 34.2'-34.4'
34.9'	104.4'		Brown to gray shale smelling faintly of oil interbedded with calcitic
			claystone and mudstone. The clay rich lean oil shale is thinly bedded with
			little turbation, and the calcitic claystone and mudstone is gray with
			indistinct bedding. Gilsonite nodules common in shale.
			Claystone 34.9'-38.3', 3.4' thick
			Mudstone 42.6'-45.5', 2.9' thick with shale chips
			Tuff (Dolomite?) 0.7' thick at 54.0'-54.7' with minor shale
			Tuff 0.1' thick at 57.6'

Corehole 78-10 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Dolomite 0.2' thick at 62.2'-62.4', with shale and ostrocods. Mudstone with
			minor shale and abundant shale chips from 68.2'-85.0-, 17.8' thick. Gray and
			calcitic, poorly bedded with some thinly bedded to highly turbated shale.
			Tuff 0.2' thick at 83.2'-83.4'
			Tuff 0.1' thick at 85.0'
			Moderately rich oil shale 85.1'-91.3', 6.2' thick
			Claystone, 92.3'-97.0', 4.7' thick, thinly bedded
104.4'	121.2'		Brown to gray lean oil shale thinly and horizontally bedded, calcareous.
			Abundant scattered and bedded ostrocods.
			Ostrocod limestone 0.3' thick at 108.2'-108.5'
			Ostrocod limestone 1.0' thick at 109.2'-110.2' oil saturated.
			Ostrocod limestone 0.6' thick at 110.9'-111.5'
			Ostrocod limestone 0.1' thick at 115.3'
			Brittle, Massive limestone 0.2' thick at 121.0'-121.2'
121.2'	257.3'		Dark brown to gray moderately lean to lean oil shale, thinly bedded with
			little turbation. Mainly noncalcareous with some light-colored calcitic
			zones with and without stromatolites.

Corehole 78-10 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Calcitic light colored shale 128.4'-129.3', 0.9' thick
			Calcitic light colored shale 132.8'-133.5', 0.7' thick
			Bivalve fossils or mud flakes 0.1' thick at 135.5'
			Tuff 0.1' thick at 140.4'
			Tuff 0.1' thick at 145.3'
			Ostrocods dolomite 0.2' thick at 150.9'-151.1'
			Ostrocods dolomite 0.5' thick at 153.5'-154.0'
			Tuffaceous zone 1.7' thick at 157.6'-159.3' ~50% shale
			Tuff 0.2' thick at 160.4'-160.6'
			Tuff 0.1' thick at 161.3'
			Tuff 0.1' thick at 161.8'
			Ostrocod limestone 0.3' thick at 162.3'-162.6'
			Ostrocod limestone 0.1' thick at 163.9'
			Ostrocod limestone 0.1' thick at 164.7'
			Tuff 0.1' thick at 168.0'
			Limestone 0.1' thick at 170.8' Stromatolites?
			Limestone 0.1' thick at ~171.7'
			Dolomite 0.4' thick at 175.05'-175.45'
			Ostrocod limestone 0.3' thick at 176.7'-177.0' turbated
			Ostrocod limestone 0.3' thick at 180.7'-181.0' oil stained
			Dolomite 0.2' thick at 187.8'-188.0' with minor shale
			Limestone 0.1' thick at 188.5' stromatolites?
			Limestone 0.2' thick at 189.3'-189.5'
			Ostrocod limestone 0.2' thick at 194.0'-194.2'

Corehole 78-10 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Limestone 0.2' thick at 194.4'-194.6'
			Dolomite 0.1' thick at 198.9'
			Dolomite 0.1' thick at 200.1'
			Dolomite 0.2' thick at 200.8'-201.0'
			Dolomite 0.1' thick at 202.6'
			Limestone 0.6' thick at 203.2'-203.8' with minor shale
			Ostrocod limestone 0.1' thick at 210.7'
			Ostrocod limestone 0.3' thick at 212.3'-212.6'
			Ostrocod limestone 0.2' thick at 215.4'-215.6'
			Dark brown moderately lean oil shale 216.2'- thick, with abundant
			lighter colored beds and stromatolites.
			Dolomite 0.1' thick at 217.9' stromatolites
			Dolomite 0.1' thick at 224.7'
			Dolomite 0.3' thick at 224.8'-225.1' stromatolites
			Dolomite 0.4' thick at 226.7'-227.1' ostrocods
			Dolomite 0.5' thick at 228.5'-229.0' ostrocods with minor shale
			Limestone 0.1' thick at 223.6' oil stairs, ostrocods
			Limestone 0.2' thick at 223.8'-224.0' oil stained, ostrocods
257.3'	271.0'		Gray to brown poorly bedded calcareous claystone with abundant bivalve fossils.

Corehole 78-10 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
271.0'	297.5'		Mudstone, siltstone, and dirty poorly sorted sandstone, gray and largely calcitic, interbedded on a scale of about 2'.
Bottom	of hole		
			Limestone, dolomite, lean oil shale, and tuff were often calcitic and texturally quite similar and may be somewhat confused in this log. Slickensides commonly ranged from horizontal to 60° and were rarely curved. Striations were usually parallel to the dip and rarely parallel to strike.

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10drilled in sec. 11, T. 3 S., R. 100 W., Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
27	28			91.3	1.5	7.9	10.4	.869
28	29			90.0	1.6	10.6	10.8	.885
29	30			83.7	2.4	29.2	6.9	.904
30	31			81.5	2.8	29.5	10.9	.906
31	32			81.2	3.0	26.5	13.9	.906
32	33			89.9	2.3	11.0	9.3	.853
33	34			88.6	1.8	15.1	9.8	.871
34	35			93.5	0.7	4.1	10.1	.920*
35	36			94.3	0.1	TRACE	13.4	——
36	37			93.9	1.3	TRACE	11.6	——
37	38			93.5	0.8	2.8	11.1	.920*
38	39			90.8	1.5	13.1	6.8	.878
39	40			88.4	1.8	18.0	7.5	.886
40	41			93.0	0.4	9.2	8.1	.853
41	42			93.9	0.7	1.6	11.5	.920*
42	43			95.5	0.2	3.6	6.9	.920*
43	44			95.6	0.7	TRACE	8.9	——
44	45			94.8	1.3	TRACE	9.2	——
45	46			95.5	0.5	1.7	8.0	.920*
46	47			88.7	1.5	18.8	6.9	.879
47	48			86.7	2.5	19.1	9.0	.879
48	49			88.6	2.2	17.3	6.7	.879
49	50			87.9	2.2	19.2	7.0	.884
50	51			89.5	0.9	17.1	8.3	.880
51	52			88.6	2.0	16.0	8.6	.873
52	53			87.7	1.8	17.5	9.9	.882
53	54			91.7	1.4	4.5	12.5	.920*
54	55			93.9	0.7	5.4	8.1	.920*
55	56			82.4	3.4	29.6	7.5	.895
56	57			80.5	4.1	32.2	8.3	.890

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
57	58			82.5	3.4	26.6	10.0	.899
58	59			87.2	2.5	17.8	8.9	.887
59	60			88.1	2.3	18.1	6.8	.891
60	61			84.6	3.2	24.4	7.2	.910
61	62			85.1	3.0	23.1	7.8	.903
62	63			86.2	2.7	23.5	5.8	.896
63	64			85.7	2.5	22.6	8.2	.893
64	65			Sample not received				
65	66			89.2	2.2	17.2	5.5	.888
66	67			91.0	1.9	11.6	6.7	.877
67	68			91.9	1.4	11.8	5.5	.891
68	69			94.8	1.2	2.9	7.0	.920 *
69	70			95.7	0.6	2.1	7.0	.920 *
85	86			82.6	2.9	30.7	7.1	.901
86	87			87.0	1.7	21.5	7.9	.889
87	88			88.7	1.7	17.3	7.5	.899
88	89			86.4	1.9	25.3	5.3	.900
89	90			83.9	2.9	27.9	6.7	.895
90	91			88.5	1.8	16.5	8.6	.893
91	92			94.9	1.1	4.6	5.3	.920 *
92	93			91.8	1.3	12.3	5.5	.907
93	94			96.1	0.5	3.0	5.4	.920 *
94	95			94.3	0.7	7.4	5.4	.887
95	96			96.1	0.4	3.7	5.0	.920 *
96	97			96.7	0.5	1.6	5.1	.920 *
97	98			95.0	0.8	5.1	5.6	.897
98	99			95.9	0.6	3.8	4.9	.920 *
99	100			95.6	0.4	4.4	5.5	.920 *
100	101			95.2	0.6	4.0	6.5	.920 *
101	102			95.6	0.3	4.4	5.7	.920 *
102	103			94.8	0.9	4.9	5.7	.920 *
103	104			95.0	0.5	5.3	6.2	.897
104	105			95.2	0.5	4.3	6.5	.920 *
105	106			94.2	0.8	6.5	6.1	.879
106	107			94.1	1.0	7.5	5.2	.862
107	108			95.2	0.6	6.0	4.7	.857

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
108	109			91.5	1.3	18.8	1.1	.871
109	110			90.5	1.1	20.8	0.8	.920 *
110	111			91.1	1.8	14.3	4.6	.865
111	112			93.8	1.0	9.7	3.4	.920 *
112	113			93.2	1.0	8.1	6.7	.884
113	114			94.5	1.0	4.8	6.5	.920 *
114	115			95.3	0.7	3.5	6.2	.920 *
115	116			92.4	1.7	10.6	4.9	.868
116	117			92.9	1.0	9.4	6.5	.867
117	118			91.7	1.2	11.2	7.1	.885
118	119			92.2	0.7	11.4	6.7	.888
119	120			92.8	1.0	8.3	7.5	.886
120	121			93.3	0.6	7.2	8.3	.869
121	122			90.7	0.9	14.9	6.9	.894
122	123			89.1	1.0	18.6	6.8	.904
123	124			88.2	1.0	20.5	7.4	.901
124	125			88.9	1.1	18.6	7.1	.904
125	126			87.4	2.1	20.2	6.7	.921
126	127			89.5	1.7	15.3	6.9	.924
127	128			89.6	1.6	13.2	9.1	.913
128	129			88.4	1.5	20.4	5.7	.910
129	130			88.1	1.9	20.4	4.9	.924
130	131			92.7	1.0	8.1	7.9	.900
131	132			90.4	1.3	13.2	7.9	.918
132	133			91.8	1.0	13.9	4.7	.902
133	134			92.8	1.2	8.2	7.3	.874
134	135			90.9	1.2	12.5	7.5	.902
135	136			90.3	1.5	15.8	5.8	.882
136	137			88.7	1.3	18.4	8.1	.862
137	138			90.6	1.1	12.1	9.4	.865
138	139			93.1	0.7	7.2	8.6	.866
139	140			91.2	1.2	7.4	11.7	.859
140	141			87.6	1.7	15.7	11.8	.889
141	142			89.0	1.7	14.9	9.2	.887
142	143			90.2	1.5	10.3	11.1	.865

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
143	144			89.6	1.7	14.7	8.0	.882
144	145			91.0	1.8	10.1	8.3	.881
145	146			90.5	1.3	8.9	11.8	.861
146	147			91.3	1.0	7.6	11.9	.875
147	148			92.3	1.3	6.4	9.9	.888
148	149			91.8	1.6	7.0	9.5	.878
149	150			90.8	1.9	8.0	10.4	.886
150	151			89.3	1.1	15.8	8.4	.909
151	152			91.0	1.1	12.4	7.7	.907
152	153			92.5	1.0	8.0	8.5	.885
153	154			94.5	0.6	7.0	5.5	.880
154	155			92.5	0.9	2.8	13.3	.920 *
155	156			92.0	1.0	7.1	10.8	.864
156	157			88.9	1.6	13.6	11.0	.865
157	158			91.0	1.3	11.7	8.0	.884
158	159			95.5	0.8	4.1	5.2	.920 *
159	160			93.8	1.1	6.3	6.9	.866
160	161			91.7	1.3	11.7	6.4	.878
161	162			90.9	1.6	11.7	7.7	.880
162	163			93.2	1.2	7.5	6.8	.881
163	164			92.4	1.0	7.7	9.2	.883
164	165			94.3	0.8	5.5	6.7	.920 *
165	166			92.8	1.4	6.5	8.4	.858
166	167			90.0	1.4	10.7	11.2	.864
167	168			92.1	1.0	8.9	8.7	.892
168	169			93.3	1.0	4.7	9.8	.857
169	170			94.6	1.5	2.6	7.0	.920 *
170	171			93.1	1.2	4.5	9.7	.920 *
171	172			92.2	1.1	9.3	7.9	.883
172	173			90.5	1.7	8.7	11.3	.868
173	174			90.6	1.4	7.1	13.2	.851
174	175			91.4	0.3	7.6	13.3	.856
175	176			95.1	1.0	5.6	4.0	.920 *
176	177			95.2	0.8	4.1	5.9	.920 *
177	178			94.0	1.0	4.5	8.0	.920 *

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
178	179			93.1	1.0	7.0	8.1	.876
179	180			89.8	1.4	13.4	9.2	.886
180	181			90.1	1.4	15.6	6.7	.882
181	182			93.6	1.1	3.5	9.5	.920 *
182	183			94.0	1.3	2.3	9.2	.920 *
183	184			93.0	1.2	3.0	11.1	.920 *
184	185			93.3	0.7	2.9	11.8	.920 *
185	186			92.2	1.1	6.7	10.3	.882
186	187			93.3	1.0	5.6	8.8	.868
187	188			89.9	1.8	9.8	11.4	.875
188	189			91.3	1.5	9.5	8.8	.887
189	190			96.7	<0.1	2.6	6.7	.920 *
190	191			94.5	<0.1	4.8	8.8	.920 *
191	192			93.7	0.2	8.8	7.2	.864
192	193			90.7	1.2	13.3	7.7	.876
193	194			89.9	1.5	13.8	8.3	.883
194	195			94.9	0.9	5.5	5.3	.877
195	196			92.2	1.3	4.8	11.1	.920 *
196	197			91.9	1.0	6.3	11.5	.864
197	198			90.4	2.5	5.3	12.3	.888
198	199			92.2	1.3	7.8	8.6	.879
199	200			84.8	2.4	19.9	13.2	.878
200	201			93.0	1.5	7.5	6.5	.897
201	202			92.4	1.1	5.2	11.0	.885
202	203			93.9	1.2	3.2	8.9	.920 *
203	204			96.4	0.8	2.8	3.9	.920 *
204	205			92.1	1.8	7.8	7.6	.899
205	206			93.5	1.4	6.1	6.9	.881
206	207			92.6	1.4	7.0	8.1	.920 *
207	208			93.9	1.1	4.2	8.3	.920 *
208	209			94.2	1.2	2.4	8.9	.920 *
209	210			92.6	2.0	3.6	9.5	.920 *
210	211			95.0	1.4	4.3	4.5	.920 *
211	212			94.2	1.9	3.3	6.3	.920 *
212	213			95.2	1.6	3.2	4.8	.920 *
213	214			91.6	1.4	TRACE	16.7	.920 *

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10 (Continued)

Depth From-To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
214-215				.3	2.1	9.0	.910
215-216				.3	1.6	6.9	.910
216-217				.5	6.0	7.2	.910
217-218				.8	8.2	6.9	.921
218-219				.8	8.3	5.8	.922
219-220				1.3	8.8	9.5	.925
220-221				.9	9.6	7.1	.922
221-222				.6	10.0	7.5	.900
222-223				.7	9.2	10.7	.869
223-224				1.1	9.1	10.2	.875
224-225				1.8	7.5	5.7	.910
225-226				1.5	15.1	8.9	.902
226-227				.3	6.6	6.9	.890
227-228				.9	9.8	11.4	.888
228-229				.6	10.1	6.2	.890
229-230				1.4	10.5	9.5	.908
230-231				1.9	13.1	10.4	.930
231-232				1.7	10.9	9.0	.912
232-233				2.3	13.7	8.4	.899
233-234				1.8	11.4	6.0	.910
234-235				2.1	13.0	8.6	.900
235-236				1.7	10.4	5.5	.893
236-237				1.6	9.9	5.4	.896
237-238				2.0	14.9	7.8	.887
238-239				1.7	13.3	7.1	.884
239-240				1.2	5.5	9.7	.910
240-241				.8	2.7	7.9	.910
241-242				.0	3.6	6.4	.910
242-243				.0	4.6	7.1	.910
243-244				.4	3.4	7.2	.910

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10 (Continued)

Depth	Yield of product						Specific gravity of oil at 60°/60° F
	Weight percent				Gal per ton		
From To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
244-245				1.4	2.0	8.3	.910
245-246				1.2	1.9	9.3	.910
246-247				1.2	3.5	8.1	.910
247-248				1.1	2.5	10.0	.910
248-249				.9	7.4	9.5	.910
249-250				1.2	8.0	6.5	.910
250-251				.7	0.0	7.9	----
251-252				.8	1.8	8.3	.910
252-253				.0	1.4	8.2	.910
253-254				.6	4.3	5.8	.910
254-255				.0	1.5	6.2	.910
255-256				.3	0.2	4.9	.910
256-257				.5	3.9	3.8	.910
257-258				1.0	0.8	6.2	.910
258-259				.6	1.4	6.2	.910
259-260				.1	0.1	5.4	.910
260-261				.2	0.3	5.1	.910
261-262				.5	1.0	8.0	.910
262-263				.0	0.2	8.5	.910
263-264				.4	1.1	6.0	.910
264-265				1.9	1.4	7.6	.910
265-266				.0	0.1	7.0	.910
266-267				.5	0.2	6.0	.910
267-268				.5	0.2	5.8	.910
268-269				1.9	0.1	8.0	.910
269-270				.9	0.2	7.2	.910
270-271				.9	1.9	8.6	.910
271-272				.1	0.0	7.8	----
272-273				.1	0.0	2.9	----
273-274				.3	0.0	4.0	----

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-10 (Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
274	275				1.0	0.0	4.3	----
275	276				1.2	0.0	5.1	----
276	277				.3	1.1	2.4	.910
277	278				1.0	0.5	3.5	.910
279	280				2.6	0.5	4.2	.910
280	281				3.1	0.4	4.8	.910
281	282				3.2	0.1	5.5	.910
282	283				1.1	1.5	3.6	.910
283	284				0.0	1.6	4.3	.910
284	285				.1	2.1	4.0	.910
285	286				.3	0.0	6.1	.910
286	287				.7	0.1	5.7	.910
287	288				.7	.1	5.7	.910
288	289				2.1	.2	7.2	.910
289	290				1.1	.1	8.1	.910
290	291				1.0	.5	10.5	.910
291	292				1.4	6.6	1.6	.910
292	293				0.0	.1	8.8	.910
293	294				0.0	.1	7.9	.910
294	295				1.2	.1	1.6	.910
295	296				.2	.1	1.1	.910
296	297				1.0	.2	3.5	.910

*Assumed specific gravity

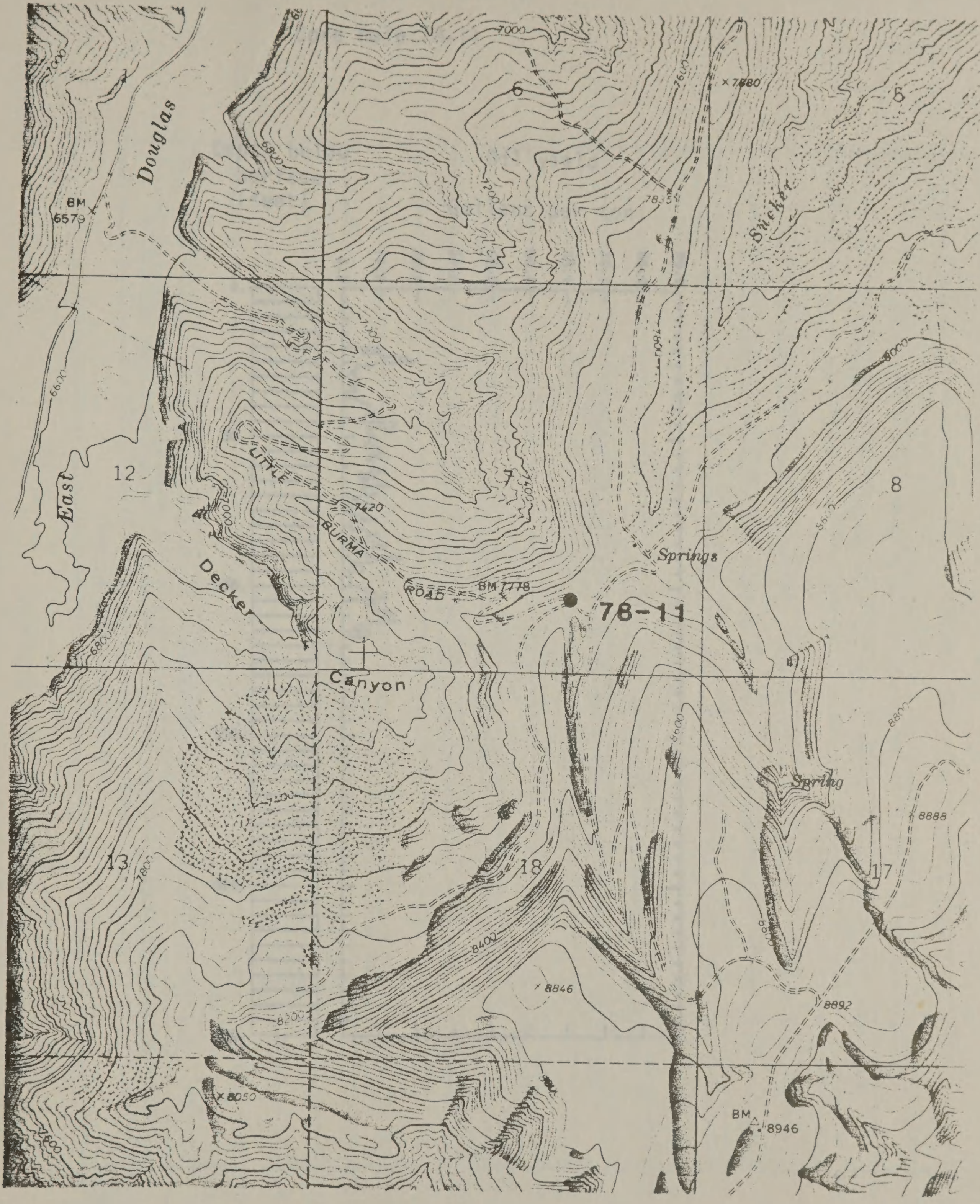
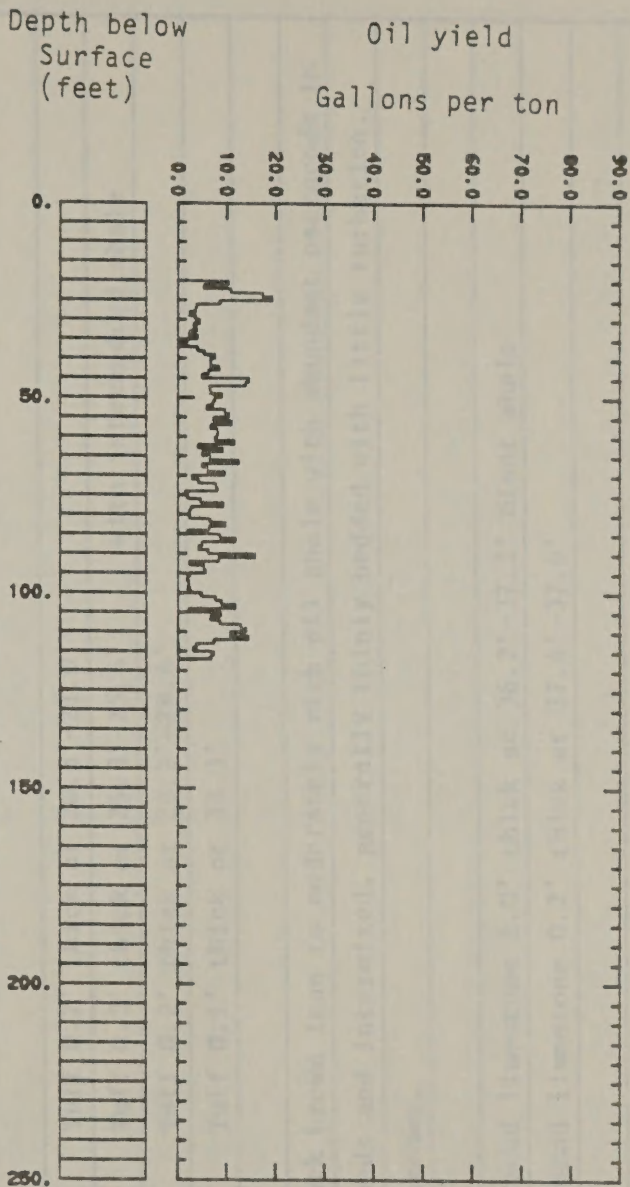


Figure 13.--Map showing location of core hole 78-11. Base from Brushy Point Quadrangle (1964). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-11



Corehole 78-11

Logged by Kurt Hollocher

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
20.0'	35.9'		Dark-brown to gray very lean oil shale, abundant clay, shrinks and cracks on
			drying. Thinly bedded with some turbation. Slightly calcareous. Rare ostrocods.
			Tuff 0.2' thick at 20.8'-21.0'
			Tuff 0.3' thick at 25.3'-25.6' with interbedded shale
			Tuff 0.2' thick at 28.2'-28.4'
			Tuff 0.1' thick at 33.3'
35.9'	45.1'		Gray to dark brown lean to moderately rich oil shale with abundant ostrocods in
			descrete beds and intermixed, generally thinly bedded with little turbation.
			Very calcareous.
			Ostrocod limestone 1.0' thick at 36.2'-37.2' minor shale
			Ostrocod limestone 0.2' thick at 37.4'-37.6'
45.1'	101.5'		Gray to dark brown lean to moderately rich oil shale with some ostrocods with
			impure or dolomitic limestone beds, thinly bedded with little turbation.
			Slickensides common. Generally calcareous. Stromatolites and conglomeritic
			textures common in dolomites.
			Dolomite (?) 0.4' thick at 46.1'-46.5' with minor shale ostrocods
			Dolomite (?) 0.2' thick at 46.8'-47.0' with minor shale ostrocods

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			Dolomite, conglomeritic 0.4' thick at 47.7'-48/1' tuffaceous?
			Dolomite, conglomeritic 0.4' thick at 49.9'-50.3' tuffaceous?
			Dolomite, 0.1' thick at 53.7'
			Dolomite, 0.2' thick at 59.1'-54.3'
			Dolomite, 0.1' thick at 56.5'
			Dolomite, ostrocods 0.9' thick at 57.0'-57.9' tuffaceous?
			Dolomite, ostrocods 0.2' thick at 61.4'-61.6' tuffaceous
			Dolomite, 0.1' thick at 62.4'
			Tuff 0.1' thick at 62.9'
			Tuff 0.1' thick at 63.6'
			Dolomite 0.1' thick at 64.3'
			Dolomite 0.2' thick at 64.6'-64.8'
			Dolomite, ostrocods 0.2' thick at 65.0'-65.2'
			Dolomite 0.1' thick at 66.6'
			Dolomite, ostrocods 0.3' thick at 66.7'-67.0' with minor shale
			Dolomite, ostrocods 0.3' thick at 67.2'-67.5' with minor shale
			Limestone, ostrocods 0.2' thick at 67.9'-68.1' with minor shale
			Dolomite 0.15' thick at 69.55'-69.70' with minor shale
			Dolomite 0.1' thick at 70.2' with minor shale
			Dolomite, ostrocods 0.3' thick at 70.8'-71.1' with minor shale
			Dolomite, ostrocods 0.2' thick at 71.8'-72.0'
			Dolomite, 0.3' thick at 74.0'-74.3' with minor shale
			Dolomite, ostrocods 0.1' thick at 75.2' with minor shale
			Dolomite, ostrocods 0.3' thick at 78.1'-78.4'

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Dolomite 0.3' thick at 82.5'-82.8'
			Dolomite oolites (pisoliths?) and ostrocods with calcite
			cement 0.4' thick at 86.3'-86.7'
			Dolomite 0.2' thick at 90.9'-91.1'
			Dolomite 0.2' thick at 91.2'-91.4' with minor shale
			Dolomite 0.1' thick at 94.0'
			Dolomite w/Stromatolites 0.3' thick at 97.0'-97.3' with minor shale
			Dolomite 0.15' thick at 97.5'-97.65' with minor shale
			Dolomite w/Stromatolites (?) 0.4' thick at 100.6'-101.0' with minor shale
			Dolomite w/Stromatolites 0.1' thick at 101.2' with minor shale
101.5'	117.4'		Similar to preceeding interval 45.1' to 101.5', but oil shale is dark gray and
			brown to nearly black and rich. Smells of H_2S as well as oil. Calcareous.
			Dolomite, stromatolites 0.4' thick at 101.7'-101.1' with minor shale
			Dolomite, stromatolites 0.1' thick at 103.6' with minor shale
			Dolomite, stromatolites 0.4' thick at 104.0'-104.4' auto conglomerate
			Dolomite, stromatolites (?) 0.1' thick at 104.8' auto conglomerate
			Dolomite 0.2' thick at 107.0'-107.2'
			Dolomite 0.2' thick at 109.7'-109.9'

Corehole 78-11 (Continued)

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
117.4'	153.0'		Gray calcareous claystone, mudstone, and dirty sandstone irregularly interbedded to massive. Some of the mudstones are fossiliferous and parts of the sandstones show crossbedding and brown oil staining.
153.0'	193.3'		Sandstone, moderately well sorted with calcite cement, medium grain size with thick indistinct bedding. Largely water saturated with dark brown oil staining. Thickly interbedded with calcareous claystone and mudstone some beds are oozing a brown thick oil
			Below about 170' the drilling water has been producing droplets of brown oil and smells strongly of oil
			Sandstone, largely oil saturated 9.4' thick at 153.0'-162.4'
			Sandstone, largely oil saturated 2.2' thick at 169.8'-172.0'
			Sandstone, largely oil saturated 17.5' thick at 173.3'-190.8'
193.3'	201.6'		Thinly bedded to massive gray mudstone and claystone with minor sand.
bottom	of hole		Calcareous with a fossiliferous unit at 201.1'-201.4', 0.3' thick.
			Bottom of Hole

Corehole 78-11 (Continued)

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			The dolomites were distinguished on the basis of texture and reaction to dilute HCl in comparison to pure calcite. Such beds occurred in shales which were both calcitic and noncalcitic. The texture of some tuffs or lean marlstones may well be the same as some dolomite and may be confused. Slickenside attitudes varied widely but were mainly between about 10° and 50° from the horizontal with striations oriented down dip.

[illegible] FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-11 drilled in sec. 7, T. 4 S., R. 100 W., Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil 1/	Water	
20.0-21.0		3.9	4.7	89.6	1.8	10.4	11.3	0.905
21.0-22.0		2.0	7.0	89.3	1.7	5.3	16.8	.905
22.0-23.0		4.1	7.0	86.4	2.5	10.9	16.8	.910
23.0-24.0		6.6	5.7	85.0	2.7	17.3	13.7	.923
24.0-25.0		7.2	5.5	84.3	3.0	19.2	13.2	.906
25.0-26.0		3.2	3.4	91.3	2.1	8.5	8.1	.907
26.0-27.0		1.4	4.0	93.2	1.4	3.7a	9.6	
27.0-28.0		1.4	4.2	93.3	1.1	3.6a	10.1	
28.0-29.0		.9	3.0	95.0	1.1	2.3a	7.2	
29.0-30.0		1.4	3.0	94.4	1.2	3.6a	7.2	
30.0-31.0		1.7	3.1	94.2	1.0	4.4a	7.4	
31.0-32.0		1.2	3.9	93.8	1.1	3.2a	9.3	
32.0-33.0		1.5	4.5	92.8	1.2	3.8a	10.8	
33.0-34.0		.8	4.0	94.3	.9	2.2a	9.6	
34.0-35.0		1.5	4.6	92.4	1.5	4.0a	11.0	
35.0-36.0		.7	3.5	94.3	1.5	1.9a	8.4	
36.0-37.0		.2	1.5	97.8	.5	.6a	3.6	
37.0-38.0		1.5	2.9	94.8	.8	4.0a	7.0	
38.0-39.0		2.0	3.5	93.4	1.1	5.4	8.4	.873
39.0-40.0		2.8	3.0	93.0	1.2	7.6	7.2	.872
40.0-41.0		2.4	3.7	92.2	1.7	6.6	8.9	.884
41.0-42.0		2.5	4.5	91.5	1.5	6.7	10.8	.886
42.0-43.0		3.1	4.1	91.4	1.4	8.4	9.8	.889
43.0-44.0		2.3	3.8	92.7	1.2	6.2	9.1	.883
44.0-45.0		1.9	4.5	92.0	1.6	5.0a	10.8	
45.0-46.0		5.5	6.0	86.5	2.0	14.5	14.4	.905
46.0-47.0		5.2	2.9	90.0	1.9	13.8	7.0	.911
47.0-48.0		2.4	4.0	92.4	1.2	6.4	9.6	.903
48.0-49.0		2.5	3.1	93.3	1.1	6.6	7.4	.900
49.0-50.0		3.2	3.1	92.4	1.2	8.9	7.4	.878
50.0-51.0		2.7	2.3	93.8	1.2	7.4	5.5	0.867
51.0-52.0		2.6	4.6	91.5	1.3	7.1	11.0	.868
52.0-53.0		2.1	4.0	92.5	1.4	5.9	9.6	.865
53.0-54.0		3.5	4.4	90.7	1.4	9.6	10.5	.881
54.0-55.0		3.9	3.5	91.3	1.3	10.4	8.4	.888
55.0-56.0		2.6	3.8	92.3	1.3	7.3	9.1	.862
56.0-57.0		4.0	4.0	89.7	2.3	10.9	9.6	.872
57.0-58.0		2.4	2.7	94.0	.9	6.6	6.5	.879
58.0-59.0		2.9	6.0	89.3	1.8	8.0	14.4	.883
59.0-60.0		3.0	4.0	91.7	1.3	8.1	9.6	.885
60.0-61.0		2.8	4.0	92.1	1.1	7.5	9.6	.887
61.0-62.0		4.4	3.3	91.0	1.3	11.5	7.9	.914
62.0-63.0		1.6	3.9	93.2	1.3	4.1a	9.3	
63.0-64.0		3.3	5.0	90.3	1.4	9.1	12.0	.870
64.0-65.0		1.9	2.6	94.6	.9	4.9a	6.2	

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-11 (Continued)

Depth From-To	Yield of product: Weight percent: Oil	Weight percent: Water	Weight percent: Spent shale	Weight percent: Gas + loss	Gal per ton: Oil 1/	Gal per ton: Water	Specific gravity of oil at 60°/60° F
65.0-66.0	2.3	2.9	93.6	1.2	6.5	7.0	.866
66.0-67.0	4.5	2.3	92.1	1.1	12.4	5.5	.871
67.0-68.0	1.9	2.4	94.9	.8	4.9a	5.8	
68.0-69.0	2.2	2.9	93.7	1.2	6.0	7.0	.864
69.0-70.0	3.5	3.5	91.9	1.1	9.5	8.4	.885
70.0-71.0	1.1	3.0	94.9	1.0	2.9a	7.2	
71.0-72.0	1.6	2.4	95.2	.8	4.2a	5.8	
72.0-73.0	2.8	4.5	91.5	1.2	7.7	10.8	.873
73.0-74.0	2.9	4.5	90.6	2.0	8.0	10.8	.868
74.0-75.0	.6	2.2	96.6	.6	1.5a	5.3	
75.0-76.0	.8	2.6	95.9	.7	2.0a	6.2	
76.0-77.0	1.7	4.0	93.0	1.3	4.6a	9.6	
77.0-78.0	3.4	2.1	93.5	1.0	9.2	5.0	.884
78.0-79.0	1.0	3.4	94.6	1.0	2.6a	8.1	
79.0-80.0	.8	3.5	94.7	1.0	2.2a	8.4	
80.0-81.0	0.9	4.5	93.3	1.3	2.4a	10.8	
81.0-82.0	2.4	4.5	91.8	1.3	6.5	10.8	0.865
82.0-83.0	3.6	4.5	90.1	1.8	9.6	10.8	.894
83.0-84.0	2.4	3.5	92.3	1.8	6.3	8.4	.902
84.0-85.0	.8	2.8	95.6	.8	2.0a	6.7	
85.0-86.0	3.1	3.6	91.8	1.5	8.6	8.6	.879
86.0-87.0	4.3	3.8	90.4	1.5	11.7	9.1	.883
87.0-88.0	1.9	2.7	94.4	1.0	4.9a	6.5	
88.0-89.0	1.6	3.6	93.3	1.5	4.2a	8.6	
89.0-90.0	2.2	3.0	93.9	.9	6.1	7.2	.878
90.0-91.0	5.8	4.2	88.3	1.7	15.7	10.1	.877
91.0-92.0	3.1	4.4	91.4	1.1	8.3	10.5	.884
92.0-93.0	.9	3.1	94.6	1.4	2.3a	7.4	
93.0-94.0	2.0	3.5	93.0	1.5	5.3	8.4	.886
94.0-95.0	2.1	3.7	92.5	1.7	5.6	8.9	.891
95.0-96.0	.9	3.5	94.5	1.1	2.3a	8.4	
96.0-97.0	.7	3.7	94.4	1.2	1.8a	8.9	
97.0-98.0	.9	3.8	94.2	1.1	2.2a	9.1	
98.0-99.0	.8	2.4	95.4	1.4	2.0a	5.8	
99.0-100.0	.9	4.4	93.1	1.6	2.5a	10.5	
100.0-101.0	1.8	2.4	94.5	1.3	4.8a	5.8	
101.0-102.0	2.9	1.7	94.1	1.3	7.6	4.1	.910
102.0-103.0	3.3	3.9	91.3	1.5	8.9	9.3	.877
103.0-104.0	4.4	2.0	92.0	1.6	11.7	4.8	.895
104.0-105.0	.8	3.8	93.4	2.0	2.1a	9.1	
105.0-106.0	3.2	5.0	89.9	1.9	8.8	12.0	.886
106.0-107.0	2.4	3.2	92.7	1.7	6.6	7.7	.880
107.0-108.0	3.2	4.2	90.7	1.9	8.5	10.1	.905
108.0-109.0	4.8	3.0	90.2	2.0	12.8	7.2	.904
109.0-110.0	5.2	3.6	89.0	2.2	13.9	8.6	.902

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-11 (Continued)

Depth From–To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil[1/]	Water	Specific gravity of oil at 60°/60° F
110.0-111.0	4.0	3.4	90.8	1.8	10.7	8.1	0.896
111.0-112.0	5.3	2.9	90.1	1.7	14.4	7.0	.882
112.0-113.0	2.7	3.8	91.9	1.6	7.3	9.1	.877
113.0-114.0	1.4	3.5	93.9	1.2	3.7a	8.4	
114.0-115.0	1.2	3.7	93.9	1.2	3.1a	8.9	
115.0-116.0	2.7	3.8	92.0	1.5	7.2	9.1	.893
116.0-117.0	2.4	3.8	92.3	1.5	6.7	9.1	.876
195.0-196.0	.0	2.9	96.1	1.0	Trace	7.0	
196.0-197.0	.0	3.4	94.8	1.8	No oil	8.1	
197.0-198.0	.0	3.4	95.1	1.5	No oil	8.2	
198.0-199.0	.0	2.7	96.4	.9	No oil	6.5	
199.0-200.0	.0	2.3	95.7	2.0	No oil	5.5	
200.0-201.0	.0	3.5	95.5	1.0	Trace	8.4	

1/ "a"--indicates specific gravity estimated as 0.92.

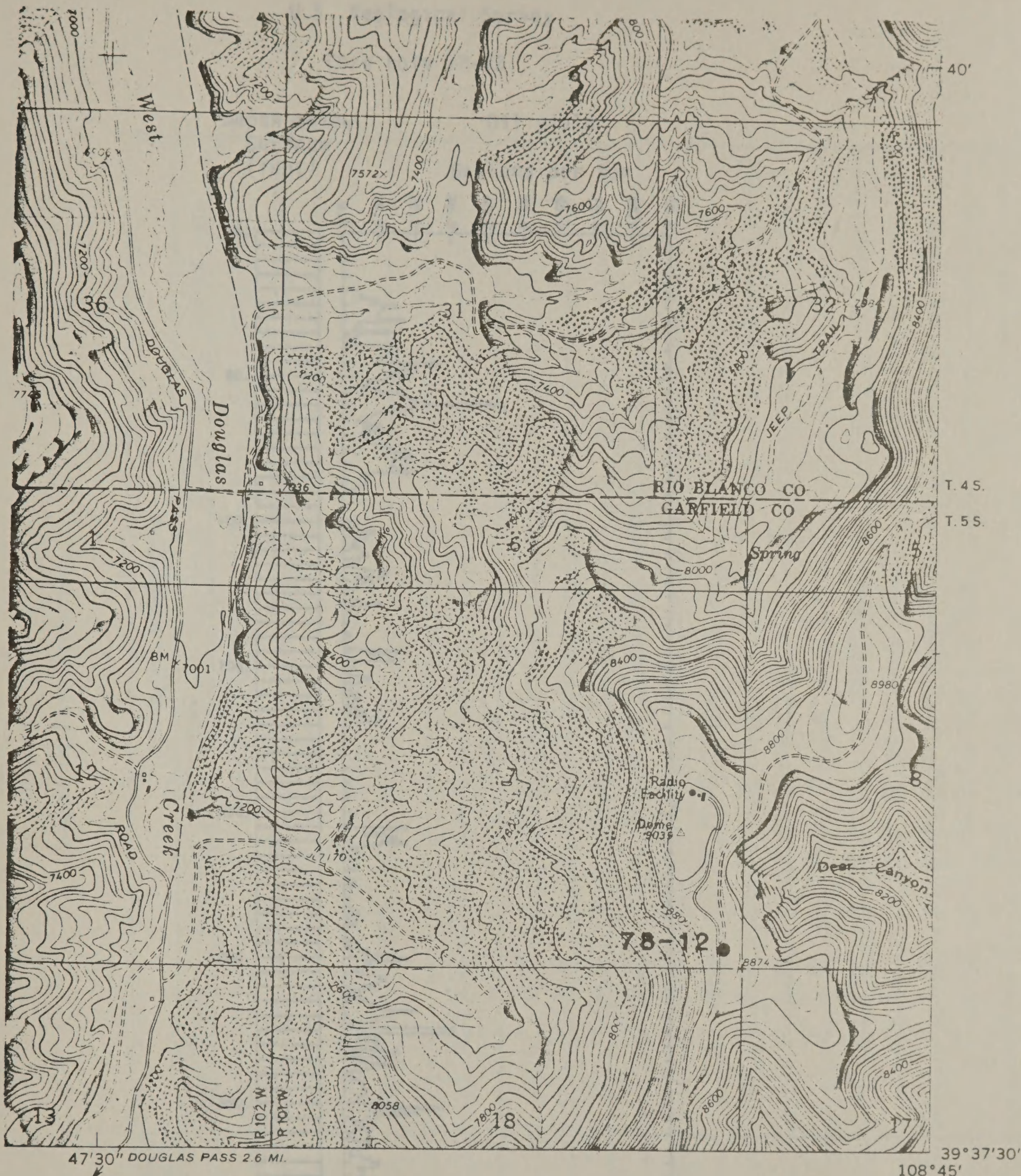
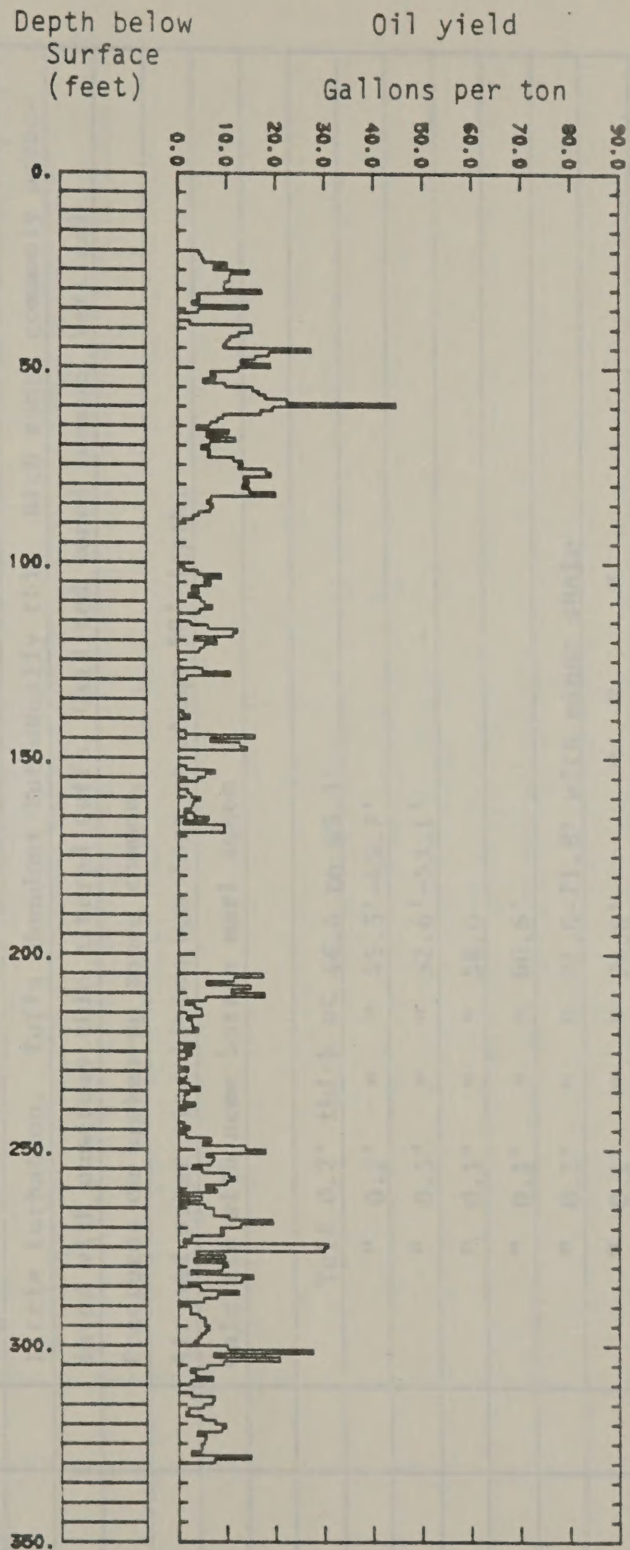


Figure 14.--Map showing location of core hole 78-12. Base from Big Foundation Creek Quadrangle (1964). Scale 1:24,000.

U.S. Geological Survey

Core hole 78-12



Corehole 78-12

Logged by Kurt Hollocher

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
20'	111.8'		Light brown to gray oil shale with many thin rich zones. Thinly bedded with
			little turbation. Tuffs abundant but usually thin. Rich zones commonly assoc-
			iated with numerous thin altered tuffs. Oxidized zones common. Vertical
			fractures on broken-up zones common.
			Air and water circulation was lost at about 50' depth.
			Calcitic with some barren marl zones
			Tuff 0.2' thick at 44.4 to 45.3'
			" 0.2' " " 45.5'-45.7'
			" 0.5' " " 52.6'-53.1'
			" 0.1' " " 58.0
			" 0.1' " " 60.6'
			" 0.2' " " 71.6-71.8' with minor shale
			" 0.1' " " 74.6' " " "
			" 0.35' " " 74.9'-75.25'
			" 0.3' " " 75.8'-76.1' " " "
			" 0.2' " " 78.4'-78.6' " " "
			" 1.1' " " 81.3'-82.8' " " "
			" 0.1' " " 90.4' Oxidized
			" 1.4' " " 91.4'-92.8' Oxidized
			" 0.2' " " 105.2'-105.4'Oxidized
			" 0.25' " " 106.05'-106.3 Oxidized
			" 0.15' " " 107.95'-107.1'

Corehole 78-12 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
111.8'	205.1'		Brown to gray lean oil shale, thinly bedded with little turbation. Thin tuffs very abundant with many thicker tuffs (some siltstone?). Many of the thicker tuffs are oxidized. Some layers are grayish green. Not calcareous.
			Tuff 0.4' thick at 113.0'-113.4' with minor shale
			" 1.5' " " 113.9'-115.4' " " "
			" 0.2' " " 117.6'-117.8'
			" 0.4' " " 120.9'-121.3' " " "
			" 0.3' " " 122.4'-122.7' " " "
			Siltstone 4.3' " " 122.7'-127.0' " " "
			Tuff 0.2' " " 128.0-128.2' " " "
			Siltstone 3.9' " " 131.6'-134.5'
			" 4.2' " " 135.7'-139.9' " " "
			Tuff 0.1' " " 144.6'
			" 0.4' " " 145.0'-145.3'
			Siltstone 4.6' " " 146.9-151.5' " " "
			Ostracods 0.05' thick at 151.85'
			Siltstone 3.8' thick at 154.6'-158.4' with minor shale

Corehole 78-12 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Siltstone 0.2' thick at 171.2'-171.4'
			" 33.4' thick at 171.7'-205.1' Iron stained
205.1'	246.9'		Gray to brown oil shale with some dark-brown rich layers. Abundant tuff.
			Thinly bedded with little turbation, calcitic. Silty
			Tuff 0.1' thick at 214.0' Turbated
			Intraformational conglomerate 0.1' thick at 218.6'
			Fine sandstone 0.1' thick at 219.7' Turbated
			Fine sandstone 0.2' thick at 219.9'-220.1'
			Siltstone with minor shale 220.2'-223.2', 3.0' thick
			Tuff 0.3' thick at 224.6'-224.9' Turbated
			Tuff 0.2' thick at 231.2'-231.4'
			Siltstone 2.4' thick at 231.9'-234.3' with minor shale
			Siltstone 4.3' thick at 238.9'-243.2' with minor shale
246.9'	330.0'		Gray to brown and dark brown oil shale with common tuff and some silt and
			siltstone, less common than above unit. Some parts calcareous
			Intraformational conglomerate 0.4' thick at 248.6'-249.0;
			Tuff 0.4' thick at 249.3'-249.7' Highly contorted
			Tuff 0.7' thick at 254.5'-255.2' Highly contorted Silty

Corehole 78-12 (Continued)

FROM	TO	THICKNESS	LITHOLOGIC DESCRIPTION
			Tuff 0.5' thick at 261.3'-261.8' Highly contorted
			" 0.4' " " 262.8'-263.2' Highly contorted
			" 0.15' " " 269.4'-269.55' Highly contorted
			" 0.1' " " 269.8' Highly contorted
			Ostracods 0.05' " " 270.3' (some ostracods below this bed)
			Highly tuffaceous and disturbed section 271.8'-273.8', 2.0' thick
			Tuff 0.1' thick at 278.3'
			Highly tuffaceous and disturbed section, 280.5'-282.2', 1.7' thick
			Tuff 0.1' thick at 286.6'
			Tuff 0.8' thick at 300.0'-300.8' Highly contorted
			" 0.3' thick at 301.85'-302.15' Highly contorted
			Intraformational conglomerate with ostracods, 302.3'-302.6'
			0.3' thick
			Tuff 0.2' thick at 306.8'-307.0' (Dolomite)
			" 0.2' thick at 308.1'-308.3'
			Ostracod dolomite 0.4' thick at 310.3'-310.7'
			" 0.6' thick at 310.9'-311.5'
			" 0.7' thick at 312.6'-313.3' (contorted) (tuffaceous?)
			" 1.3' thick at 314.3'-315.6' "
			" 0.3' thick at 316.2'-316.5' "
			Stromatolites(?) at 318.7'
			Ostracod dolomite 0.3' thick at 319.6'0319.9'
			" 0.4' thick at 320.6'-321.0' with stromatolites

Corehole 78-12 (Continued)

FROM	TO	THICK-NESS	LITHOLOGIC DESCRIPTION
			Ostracod dolomite 0.3' thick at 322.4'-322.7' with stromtolites?
			" 0.1' thick at 323.5' Nodule
			" 0.2' thick at 324.1'-324.3' contorted
			" 0.8' thick at 326.5'-327.3'
			" " 0.5' thick at 328.6'-329.1' stromatolites?
			COMMENTS:
			Vertical fractures are relatively common, but slickensides are absent.
			Much of the material labeled as tuff may in fact be dolomitic marl, dolomite,
			or thin sandstone units, as textures and colors are often very similar.
			No thick sections of rich, dark oil shale were seen, although thin units up to
			+0~3' thick are common throughout the section. Oxidized zones are common
			to a depth of about 200'.

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12 drilled in sec. 7, T. 5 S., R 101 W., Rio Blanco County, Colorado

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
20	21			94.5	1.4	4.4	5.7	.920 *
21	22			95.2	0.7	4.9	5.3	.920 *
22	23			95.6	0.3	5.3	4.7	.953
23	24			94.1	1.0	10.2	2.5	.911
24	25			95.0	0.8	7.4	3.4	.909
25	26			91.4	1.4	14.7	3.7	.915
26	27			93.5	0.7	10.7	4.1	.912
27	28			93.2	0.9	10.6	4.6	.911
28	29			93.1	1.3	9.6	4.7	.915
29	30			93.3	1.1	9.5	4.7	.912
30	31			89.9	1.6	17.2	4.7	.908
31	32			96.9	<0.1	3.9	4.5	.920 *
32	33			96.3	0.3	4.5	4.1	.920 *
33	34			97.1	0.3	2.9	3.6	.920 *
34	35			92.2	1.1	14.5	2.7	.917
35	36			96.2	0.6	4.2	3.9	.920 *
36	37			97.2	0.1	0.0	5.8	.920 *
37	38			97.6	0.5	0.0	4.3	.920 *
38	39			96.0	0.7	2.5	5.4	.920 *
39	40			90.4	1.8	15.1	5.0	.897
40	41			89.6	1.6	15.2	7.3	.908
41	42			91.2	1.5	12.6	6.1	.904
42	43			94.1	0.8	10.7	2.7	.900
43	44			91.5	1.4	10.0	7.8	.910
44	45			92.1	1.2	9.4	7.6	.920
45	46			86.8	1.7	27.3	3.2	.890
46	47			89.2	1.9	18.7	4.6	.899
47	48			90.6	1.5	15.8	4.6	.908
48	49			92.3	0.9	13.0	4.5	.911
49	50			89.9	1.5	19.0	3.4	.905

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
50	51			93.1	0.8	12.4	3.3	.905
51	52			93.6	0.4	6.7	8.1	.923
52	53			92.7	2.2	7.8	5.1	.913
53	54			94.0	1.8	5.2	5.2	.905
54	55			92.6	2.2	9.8	3.5	.902
55	56			90.7	2.2	15.4	2.9	.913
56	57			90.3	2.4	16.6	2.6	.900
57	58			89.8	2.6	18.0	2.0	.902
58	59			89.3	1.2	22.4	2.4	.912
59	60			79.1	2.6	44.6	3.7	.903
60	61			89.8	1.4	19.4	3.5	.906
61	62			91.9	0.9	17.0	1.9	.913
62	63			92.9	0.4	9.3	7.5	.929
63	64			93.1	1.2	8.2	5.9	.937
64	65			95.5	1.2	6.7	1.8	.917
65	66			96.4	1.1	3.9	2.2	.920 *
66	67			89.0	5.7	10.6	3.0	.919
67	68			96.2	0.8	5.9	1.8	.907
68	69			93.3	1.4	11.9	1.8	.916
69	70			93.7	1.3	6.7	5.9	.925
70	71			94.6	2.1	4.8	3.6	.920 *
71	72			95.4	1.4	6.6	1.7	.910
72	73			94.7	1.9	6.2	2.3	.927
73	74			93.0	2.1	11.5	1.2	.912
74	75			92.3	1.9	13.3	1.8	.916
75	76			92.7	1.9	12.5	1.7	.908
76	77			90.1	2.2	18.2	1.8	.915
77	78			89.8	2.2	19.1	1.8	.908
78	79			92.2	2.0	13.5	1.7	.902
79	80			91.6	2.1	14.6	1.6	.920
80	81			91.9	2.3	13.3	1.6	.907
81	82			91.5	2.2	14.7	1.8	.903
82	83			88.8	2.8	20.0	1.8	.911
83	84			94.8	1.7	6.8	2.3	.924
84	85			95.3	1.5	6.0	2.2	.935

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
85	86			96.4	<0.1	7.2	2.3	.922
86	87			96.4	0.1	6.6	2.1	.917
87	89			97.1	0.3	4.3	2.4	.920 *
88	89			96.7	0.9	3.1	2.7	.920 *
89	90			97.7	0.3	1.1	3.8	.920 *
90	91			98.3	0.1	0.0	4.3	.920 *
91	92			97.8	0.4	0.0	4.3	.920 *
92	93			99.2	<0.1	N.D.	1.9	——
93	94			98.8	<0.1	N.D.	3.2	——
94	95			98.4	0.1	N.D.	3.5	——
95	96			97.6	0.7	0.0	4.0	.920 *
96	97			97.4	0.6	0.0	5.0	.920 *
97	98			97.8	0.7	N.D.	3.4	——
98	99			97.9	0.7	0.0	3.5	.920 *
99	100			97.5	0.8	N.D.	4.2	——
100	101			96.8	0.9	0.0	5.5	.920 *
101	102			98.3	0.3	1.3	2.2	.920 *
102	103			96.0	1.1	4.1	3.4	.920 *
103	104			93.9	1.7	8.9	2.4	.915
104	105			95.7	1.2	5.3	2.5	.920 *
105	106			95.1	0.9	6.8	3.4	.920 *
106	107			97.4	0.8	2.8	1.8	.920 *
107	108			96.3	1.4	4.3	1.6	.920 *
108	109			97.2	1.1	2.1	2.2	.920 *
109	110			96.6	1.1	4.7	1.2	.920 *
110	111			95.5	1.6	5.5	1.8	.908
111	112			94.1	1.3	7.0	4.8	.904
112	113			94.5	0.7	4.4	7.3	.920 *
113	114			98.0	<0.1	0.0	4.7	.920 *
114	115			99.1	<0.1	0.0	1.8	.920 *
115	116			96.2	0.3	2.6	5.8	.920 *
116	117			96.7	0.5	6.2	1.1	.902
117	118			92.4	1.5	12.2	3.5	.903
118	119			93.0	1.7	11.3	2.6	.903
119	120			96.6	0.8	3.3	3.3	.920 *

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12 (Continued)

Depth From	Depth To	Yield of product: Weight percent Oil	Weight percent Water	Weight percent Spent shale	Weight percent Gas + loss	Gal per ton Oil	Gal per ton Water	Specific gravity of oil at 60°/60° F
120	121			95.0	1.2	8.0	1.9	.920
121	122			95.7	1.1	5.4	2.5	.920 *
122	123			95.9	0.8	4.4	3.8	.920 *
123	124			98.8	0.7	0.0	1.3	.920 *
124	125			98.2	1.1	0.0	1.6	.920 *
125	126			98.3	0.8	0.0	2.1	.920 *
126	127			97.9	0.8	0.0	3.0	.920 *
127	128			95.2	1.4	5.0	3.5	.920 *
128	129			92.5	1.4	10.7	4.9	.900
129	130			97.6	0.9	1.8	1.9	.920 *
130	131			97.1	0.6	N.D.	5.3	----
131	132			96.2	0.8	N.D.	7.1	----
132	133			96.4	0.9	N.D.	6.5	----
133	134			99.1	<0.1		5.0	.920 *
134	135			98.7	<0.1	0.0	5.7	.920 *
135	136			98.3	<0.1	0.0	6.5	.920 *
136	137			98.0	<0.1	0.0	6.9	.920 *
137	138			97.7	<0.1	0.0	7.2	.920 *
138	139			97.0	<0.1	1.0	6.7	.920 *
139	140			97.4	<0.1	2.3	5.0	.920 *
140	141			95.9	0.2	0.0	8.8	.920 *
141	142			95.0	0.7	0.0	10.3	.920 *
142	143			95.2	0.4	0.0	10.5	.920 *
143	144			97.8	0.6	1.5	2.5	.920 *
144	145			91.3	1.9	15.7	1.9	.916
145	146			95.1	1.4	6.5	2.4	.913
146	147			91.1	1.7	12.6	5.8	.907
147	148			90.2	2.0	14.1	6.1	.898
148	149			98.2	0.7	N.D.	2.5	----
149	150			98.1	1.0	N.D.	2.2	----
150	151			97.4	1.6	0.0	2.2	.920 *
151	152			97.8	1.5	0.0	1.8	.920 *
152	153			97.4	0.9	1.6	2.4	.920 *
153	154			94.1	1.4	7.5	4.0	.915

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
154	155			94.6	1.3	5.5	4.8	.920 *
155	156			96.8	0.6	4.0	2.5	.920 *
156	157			99.1	0.4	N.D.	1.2	——
157	158			99.0	<0.1	0.0	2.7	.920 *
158	159			97.2	0.3	1.9	4.3	.920 *
159	160			96.4	0.5	2.7	5.0	.920 *
160	161			95.7	0.6	4.5	4.7	.920 *
161	162			95.8	0.4	3.0	6.4	.920 *
162	163			94.6	0.8	2.7	8.5	.920 *
163	164			95.1	0.4	1.3	9.5	.920 *
164	165			95.2	0.4	3.3	7.7	.920 *
165	166			95.2	0.4	6.3	4.8	.920 *
166	167			98.3	0.5	1.1	1.9	.920 *
167	168			94.2	0.9	9.5	2.8	.916
168	169			93.7	0.9	9.6	4.3	.896
169	170			98.7	<0.1	0.0	3.4	.920 *
170	171			97.6	0.3	0.0	5.1	.920 *
205	206			90.0	1.7	17.5	4.0	.903
206	207			93.0	1.1	11.4	3.7	.915
207	208			92.7	1.2	5.7	9.3	.912
208	209			91.0	1.3	14.9	4.8	.912
209	210			91.5	1.3	10.8	7.6	.911
210	211			89.1	2.2	17.7	4.5	.919
211	212			96.2	0.6	5.6	2.4	.920 *
212	213			98.3	0.1	1.4	2.3	.920 *
213	214			97.1	0.6	3.3	2.5	.920 *
214	215			96.7	0.7	4.7	1.9	.920 *
215	216			96.5	0.6	4.9	2.6	.920 *
216	217			98.0	0.6	1.7	1.7	.920 *
217	218			97.8	0.6	2.7	1.4	.920 *
218	219			97.3	0.9	2.9	1.6	.920 *
219	220			97.3	0.4	4.0	1.7	.920 *
220	221			98.7	0.5	0.0	2.0	.920 *
221	222			99.2	0.1	0.0	1.6	.920 *
222	223			98.7	0.5	0.0	1.7	.920 *

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12(Continued)

Depth		Yield of product						Specific gravity of oil at 60°/60° F
		Weight percent				Gal per ton		
From	To	Oil	Water	Spent shale	Gas + loss	Oil	Water	
223	224			97.3	1.0	3.2	1.2	.920 *
224	225			97.8	0.7	1.2	2.6	.920 *
225	226			97.4	1.1	2.6	1.2	.920 *
226	227			97.4	1.2	1.6	1.9	.920 *
227	228			98.2	1.0	0.0	2.0	.920 *
228	229			99.9	<0.1	N.D.	0.7	——
229	230			98.2	0.5	2.0	1.1	.920 *
230	231			98.8	0.1	1.6	1.1	.920 *
231	232			98.6	0.2	1.6	1.2	.920 *
232	233			99.4	<0.1	N.D.	1.3	——
233	234			97.4	1.1	2.3	1.4	.920 *
234	235			96.5	1.1	4.4	1.9	.920 *
235	236			97.4	0.8	2.1	2.4	.920 *
236	237			98.0	0.8	1.2	1.9	.920 *
237	238			98.0	1.0	1.1	1.6	.920 *
238	239			97.1	1.1	3.4	1.2	.920 *
239	240			99.7	<0.1	0.0	1.0	.920 *
240	241			99.8	0.1	N.D.	0.2	——
241	242			99.8	<0.1	N.D.	0.4	——
242	243			99.7	<0.1	N.D.	0.8	——
243	244			98.9	<0.1	1.1	1.4	.920 *
244	245			97.6	0.8	2.3	1.8	.920 *
245	246			97.3	0.4	0.0	4.9	.920 *
246	247			98.2	0.2	1.6	2.3	.920 *
247	248			94.8	1.2	6.8	3.6	.896
248	249			95.8	1.1	4.9	2.7	.920 *
249	250			91.4	1.7	13.8	4.1	.896
250	251			89.2	2.5	17.9	3.7	.915
251	252			95.0	1.8	5.7	2.4	.909
252	253			95.0	1.4	7.4	2.1	.906
253	254			95.4	1.3	6.8	1.7	.912
254	255			97.7	0.7	2.8	1.2	.920 *
255	256			95.5	1.0	4.9	3.7	.939
256	257			94.2	1.2	10.4	1.8	.908
257	258			93.6	1.2	11.5	2.1	.908

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
258	259			94.1	1.0	10.0	2.7	.901
259	260			94.1	0.9	5.6	7.0	.915
260	261			93.1	1.4	7.9	6.0	.900
261	262			98.9	0.2	0.0	2.1	.920 *
262	263			96.6	0.7	4.9	1.9	.934
263	264			98.9	0.8	0.0	0.7	.920 *
264	265			96.2	1.1	5.5	1.3	.925
265	266			93.9	1.3	7.3	4.8	.920 *
266	267			93.6	1.0	7.3	6.1	.920 *
267	268			91.8	1.7	10.5	5.7	.927
268	269			87.6	2.7	19.4	5.8	.906
269	270			91.4	1.8	12.8	4.9	.894
270	271			93.4	1.3	8.6	4.7	.920 *
271	272			93.1	1.2	9.3	5.1	.920 *
272	273			96.4	2.0	2.7	1.2	.920 *
273	274			98.6	0.5	1.1	1.2	.920 *
274	275			82.6	3.7	30.8	5.1	.905
275	276			81.3	4.6	30.0	6.6	.904
276	277			95.5	1.9	3.6	2.9	.920 *
277	278			91.9	1.9	9.7	5.9	.920 *
278	279			95.8	1.8	3.1	2.9	.920 *
279	280			93.0	2.2	10.3	2.2	.898
280	281			94.1	1.8	9.0	1.8	.887
281	282			97.1	1.3	2.5	1.4	.920 *
282	283			91.4	2.3	15.4	1.2	.894
283	284			91.7	1.3	13.1	4.8	.909
284	285			98.0	0.5	1.9	1.7	.920 *
285	286			97.0	0.6	4.5	1.6	.920 *
286	287			93.3	0.8	12.5	2.8	.914
287	288			93.2	0.7	8.0	7.4	.907
288	289			95.1	0.2	5.3	6.2	.920 *
289	290			98.1	0.1	0.0	4.3	.920 *
290	291			97.1	0.1	2.6	3.4	.920 *
291	292			96.8	0.5	2.4	4.3	.920 *
292	293			95.3	1.0	4.4	4.9	.920 *
293	294			94.4	1.0	5.6	5.8	.920 *

OIL-SHALE ASSAYS BY MODIFIED FISCHER RETORT METHOD

Samples from the U.S. Geological Survey's Corehole 78-12 (Continued)

Depth From	Depth To	Yield of product: Weight percent: Oil	Water	Spent shale	Gas + loss	Gal per ton: Oil	Water	Specific gravity of oil at 60°/60° F
294	295			94.8	0.4	5.4	6.4	.920 *
295	296			93.0	1.3	6.4	7.6	.920 *
296	297			93.0	1.2	5.6	8.7	.920 *
297	298			93.0	1.1	4.7	9.9	.920 *
298	299			95.4	0.4	4.0	6.4	.920 *
299	300			93.8	0.5	3.1	10.8	.920 *
300	301			94.0	1.4	10.1	1.9	.911
301	302			85.2	2.0	27.7	5.4	.910
302	303			95.2	1.2	7.2	2.2	.907
303	304			86.3	3.7	20.9	5.3	.901
304	305			90.1	3.0	9.3	8.3	.899
305	306			92.9	2.8	5.9	5.0	.904
306	307			96.2	1.9	2.4	2.3	.920 *
307	308			97.2	0.3	3.6	2.5	.920 *
308	309			95.0	0.2	7.1	4.8	.932
309	310			98.0	<0.1	2.4	2.8	.920 *
310	311			99.7	<0.1	0.0	1.6	.920 *
311	312			98.9	0.3	0.0	0.9	.920 *
312	313			97.8	0.6	2.7	1.4	.920 *
313	314			94.5	1.6	7.4	2.6	.912
314	315			95.6	1.3	7.0	1.2	.902
315	316			96.7	0.4	5.1	2.2	.921
316	317			97.8	0.6	2.0	1.9	.920 *
317	318			98.0	0.8	1.5	1.5	.920 *
318	319			96.3	1.1	4.9	1.7	.920 *
319	320			95.2	1.3	7.5	1.8	.904
320	321			94.1	1.3	9.7	2.1	.911
321	322			94.5	1.3	8.8	2.1	.913
322	323			96.4	1.2	3.7	2.4	.920 *
323	324			96.4	0.2	5.7	2.7	.924
324	325			98.1	<0.1	5.3	3.8	.920 *
325	326			95.9	<0.1	4.6	8.5	.920 *
326	327			98.7	<0.1	4.8	2.0	.920 *
327	328			99.2	<0.1	2.6	1.6	.920 *
328	329			93.8	<0.1	14.9	2.7	.908
329	330			96.4	<0.1	7.4	4.8	.906

* Assumed specific gravity.